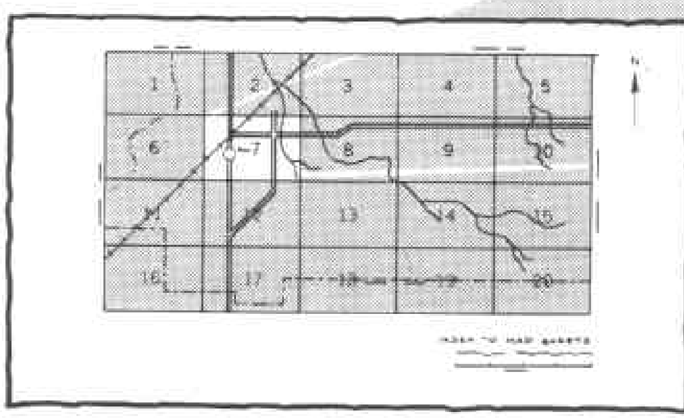
soil survey of

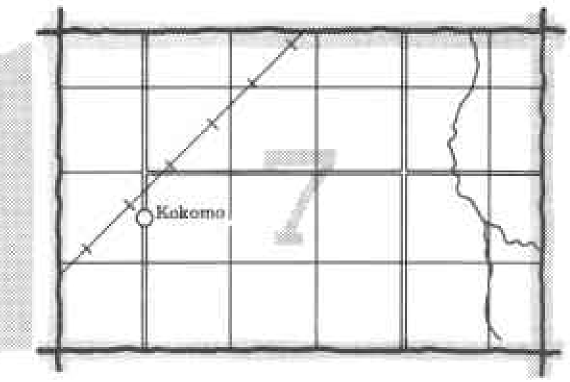
Knox County Indiana

United States Department of Agriculture
Soil Conservation Service
in cooperation with the
Purdue University
Agricultural Experiment Station and the
Indiana Department of Natural Resources
Soil and Water Conservation Committee

HOW TO USE

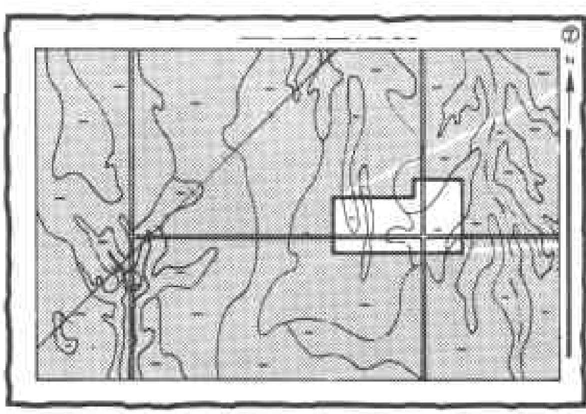
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

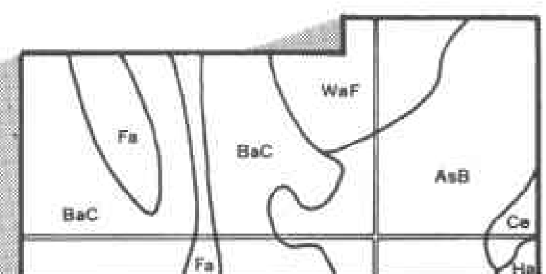




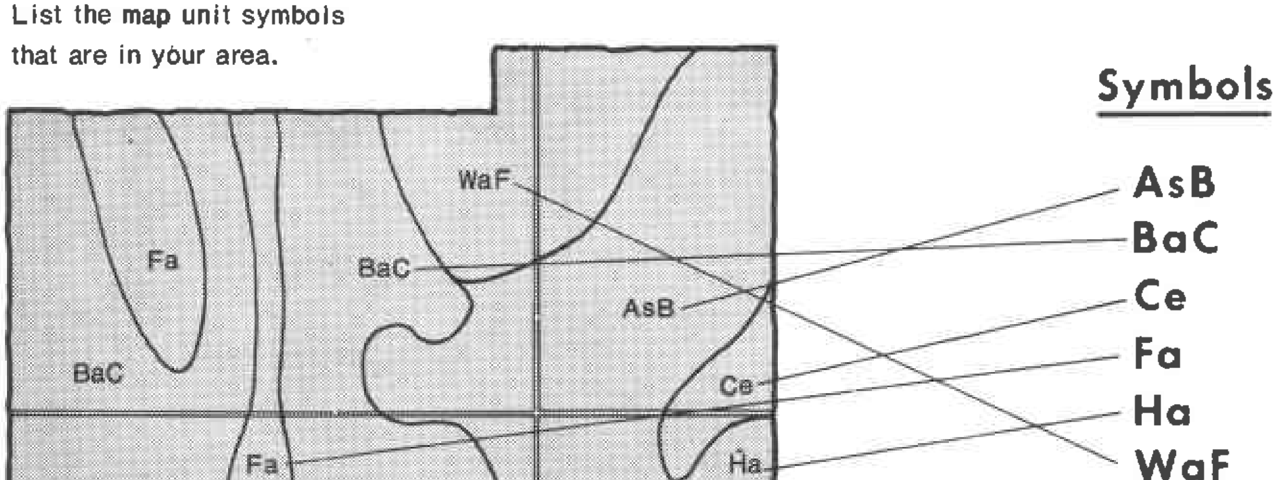
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



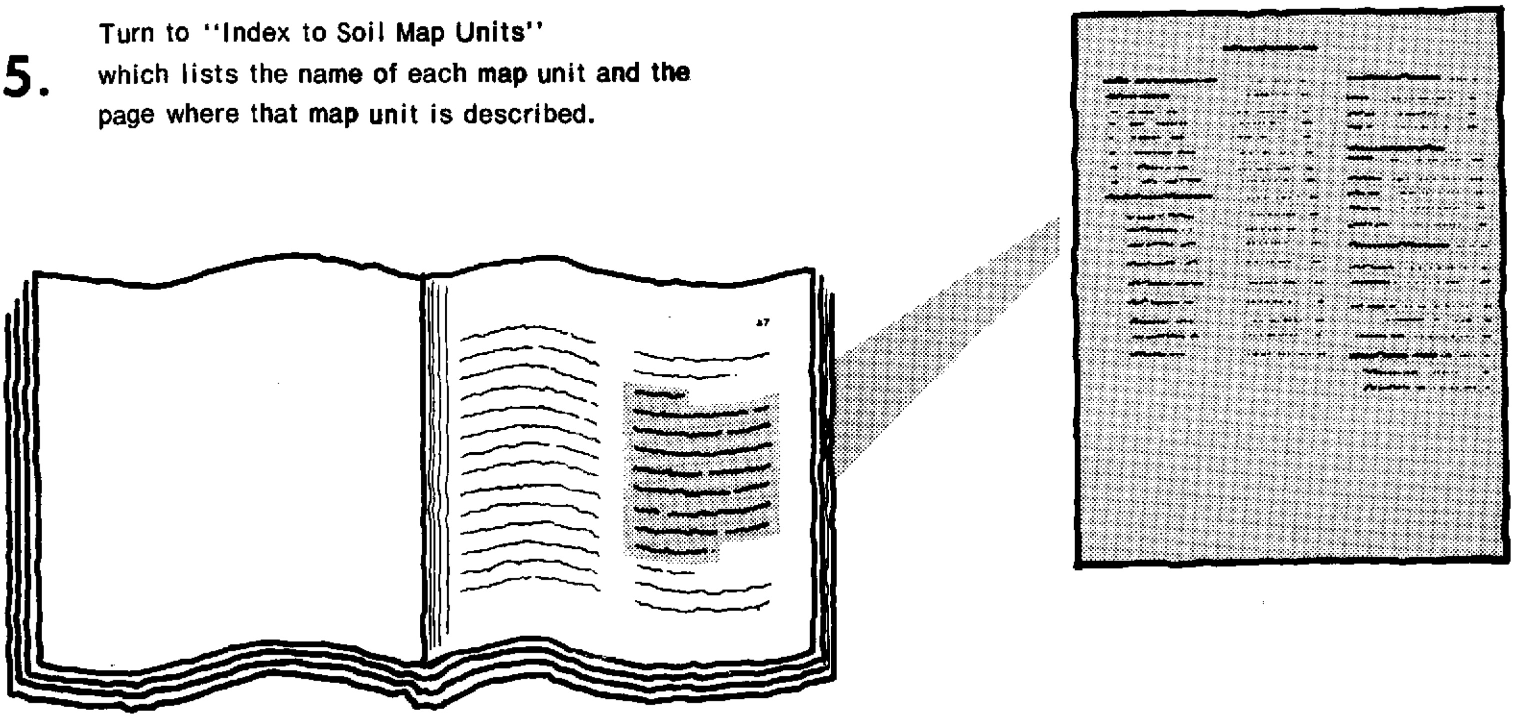


4. List the map unit symbols that are in your area.

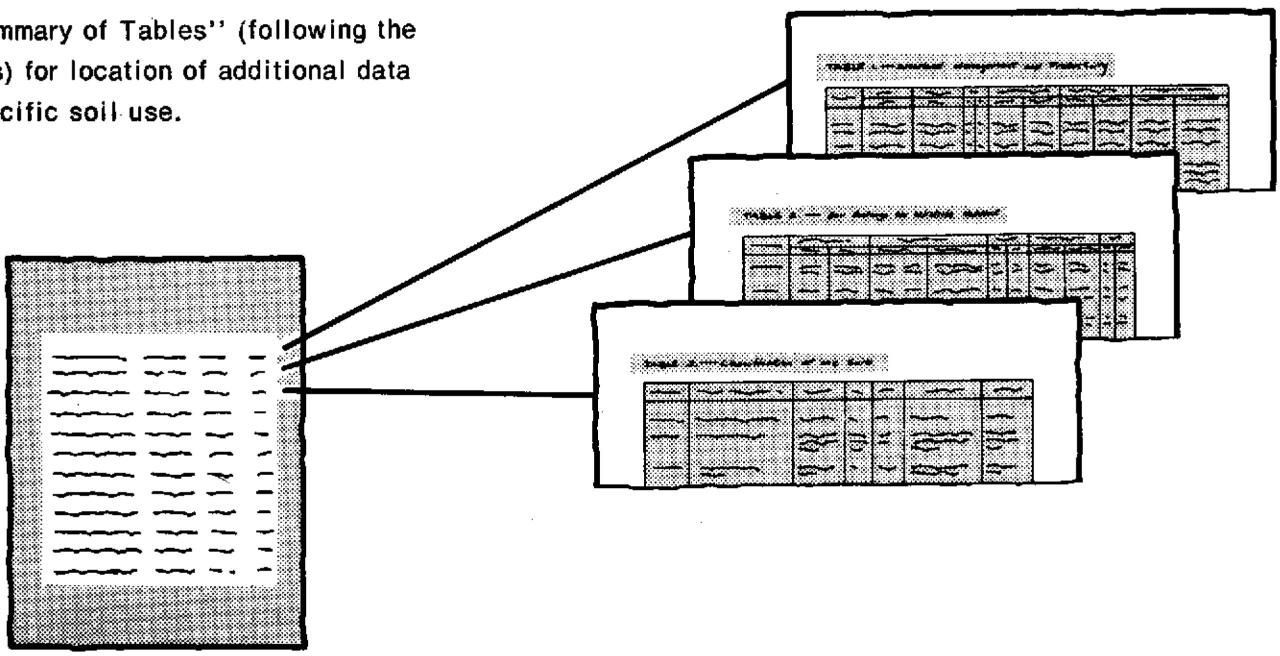


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1973-78. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publicaton refer to conditions in the survey area in 1978. This survey was made cooperatively by the Soil Conservation Service; the Purdue University Agricultural Experiment Station; and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Knox County Soil and Water Conservation District, which helped fund the survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Small lake constructed in Alford and Hickory soils south of Vincennes.

contents

soil series

Issued December 1981

index to soil map units

summary of tables

foreword

This soil survey contains information that can be used in land-planning programs in Knox County, Indiana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

The first survey of Knox County was published in 1943 (*9*). This survey updates that first survey and provides additional information and larger, more detailed maps.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Robert L. Eddleman

Robert L. Eddleman
State Conservationist
Soil Conservation Service

soil survey of
Knox County, Indiana

By Leo A. Kelly, Soil Conservation Service

Fieldwork by Leo A. Kelly, Travis Neely, and George McElrath Jr.,
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with
The Purdue University Agricultural Experiment Station and
The Indiana Department of Natural Resources,
Soil and Water Conservation Committee

Knox County is in the southwestern part of Indiana, in the pocket formed by the junction of the White and Wabash Rivers (fig. 1). It has a land area of 517 square miles, or 330,880 acres. Vincennes, the county seat, is along the Wabash River in the west-central part of the county. In 1970 Vincennes had a population of 19,867. The population of the county in 1970 was 41,546.

The county has three types of relief.

- Windblown sand deposits give the western part of the uplands a dunelike appearance. This land is rolling and rather highly dissected, with some depressions.
- The rest of the uplands has, in general, a gently rolling to rolling relief and is moderately dissected by drainage. This land consists of windblown silts underlain by glacial deposits or bedrock.
- The county is drained on three sides by the Wabash and White Rivers, resulting in broad extensive bottom lands and terraces. The bottom lands are subject to frequent flooding, and the terraces sometimes fill with backwater in periods of overflow.

Farming is the main source of income in the county. In 1974, according to the U.S. Census of Agriculture, about 254,371 acres was farmed. Of this acreage, about 82 percent was used for cultivated crops, 4 percent for other crops, 7 percent for pasture, and 7 percent for woodland. Corn, soybeans, and wheat are the main crops. Small but productive truck farms and orchards are prevalent. Most urban development is centered around Vincennes and is increasing only slightly.

general nature of the county

This section gives general information on the features that affect soil use. It describes the climate; relief; water supply; settlement; industries, transportation, and markets; and trends in population and land use.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Vincennes in the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 32 degrees F, and the average daily minimum temperature is 23 degrees. The lowest temperature on record, which occurred at Vincennes on February 2, 1951, is minus 19 degrees. In summer the average temperature is 75 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred on July 15, 1954, is 107 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 23 inches, or 60 percent, usually falls in April through September, which

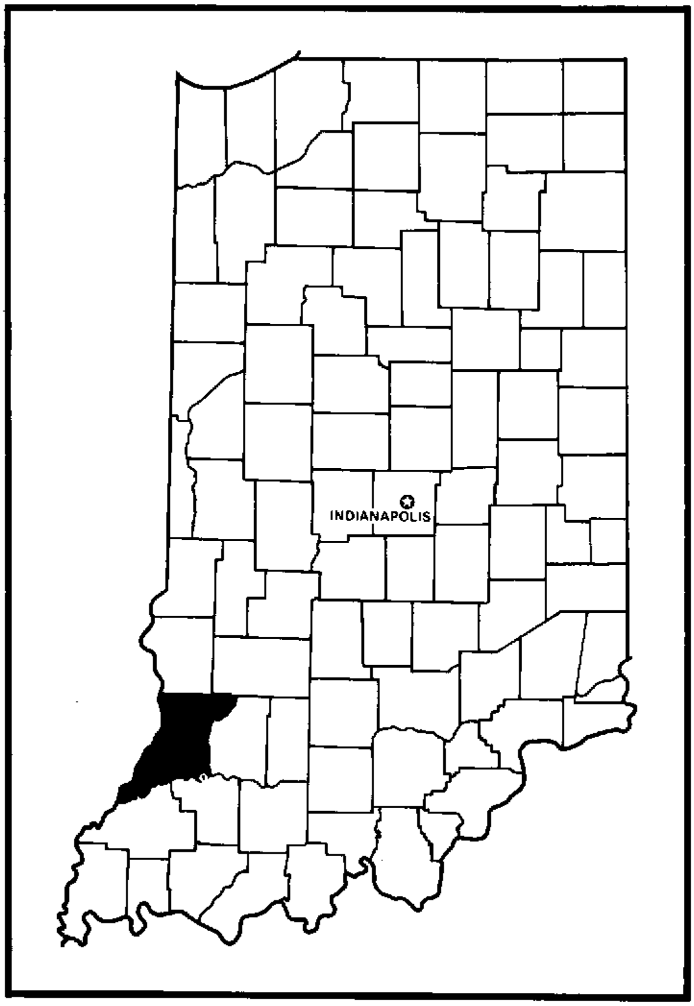


Figure 1.—Location of Knox County in Indiana.

includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 5.18 inches at Vincennes on May 8, 1961. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is 13 inches. The greatest snow depth at any one time during the period of record was 10 inches. On an average of 7 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 80 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the south-southwest. Average windspeed is highest, 10 miles per hour, in spring.

relief

The highest point in Knox County is 620 feet above sea level. It is located along State Highway 67 about 3 miles west of Bicknell in donation 122. The lowest point is 376 feet above sea level and is located at the junction of the Wabash and White Rivers.

Physiographically, Knox County lies in the Wabash lowland section of Indiana. This section is characterized by the filling in of valleys so that streams develop extensive bottoms out of proportion to their size, the presence of island hills, and the gently rolling relief of the uplands (*7*).

water supply

Drilled wells are the principal type of water wells in the county. A small number of driven and dug wells are also still in use.

In the upland areas sandstone rock is the principal source of ground water and is tapped extensively for domestic and livestock uses. Well depths range from about 40 to 400 feet. The average depth is generally less than 200 feet. Yields of water from these wells are generally less than 20 gallons per minute, and numerous wells have been abandoned because of insufficient water.

On bottom lands and terraces along the Wabash and White Rivers, wells that yield several hundred gallons per minute have been developed in underlying sand and gravel deposits. These deposits are an important souce of water for domestic, industrial, and irrigation supplies. The cities of Vincennes, Bicknell, Freelandville, Oaktown, Monroe City, Bruceville, Wheatland, and Sandborn receive their water from deep wells in these deposits. Construction of a countywide water system is well underway in parts of the county.

The quality of water from drilled wells varies greatly. In most upland areas the iron content and either the chloride or sulfate content exceed the U.S. Public Health Service (1946) standards for drinking water. In areas where ground water yields are low or where the chloride and sulfate content is excessively high, the water must come from lakes, ponds, or rural water systems. A large number of ponds have been constructed on farms for water supply, fire protection, and wildlife habitat.

settlement

The earliest settlers were French traders. About 1680 a French trading post and military station was located at an Indian village at the present site of Vincennes. Vincennes was an early fur trading post and is the oldest continuous settlement in Indiana. It was founded about 1732 and was the first capital of Indiana Territory. When Knox County was organized in 1790, it became the county seat.

Knox County was organized by Winthrop Sargent, an agent of the Governor of Virginia, and was named in honor of Henry Knox, the first secretary of war (*3*). It was the first county formed in the old Northwest Territory. Originally it covered all of Indiana and large parts of Ohio, Illinois, Michigan, and Wisconsin. About 1815 the county was laid out with its present boundaries.

industries, transportation, and markets

In addition to farming, mining, and oil industries, there are other important industries in the county. Vincennes has modern hospital and medical facilities and serves as a medical center for surrounding counties.

Two major railroads and two Federal highways pass through the county. U.S. Highway 41 passes from north to south, and U.S. Highway 50 passes from east to west. Livestock markets are within a reasonable distance.

The larger markets within a 120-mile radius are in Louisville, Evansville, and Indianapolis. Smaller markets are at Vincennes, Wheatland, and Linton. Grain elevators along with truck and rail transportation provide adequate handling of grain at harvest time.

trends in population and land use

Knox County has a population of about 41,546 persons. The population remained stable between 1960 and 1970 but is expected to increase slightly by the year 1985.

During the period 1969 to 1974 the urban area increased by less than 1 percent. About 85 percent of the county remains in agriculture. The number of farms decreased from 1,192 in 1969 to 1,035 in 1974. At the same time, the average size of farms increased from 252 acres to 270 acres.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, woodland, urban uses,* and *intensive recreation areas.* Cultivated crops are those grown extensively in the survey area. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic.

The general soil map units in this survey do not fully agree with those in surveys of adjacent counties. Some differences are a result of improvements in the classifications of soils, particularly in the soil series concepts. In addition, maps have been made more precise and detailed in recent years because the uses of the general soil maps have expanded. Another difference is caused by variations in the range of slope permitted in associations in different surveys.

soil descriptions

1. Alford-Sylvan

Nearly level to very steep, well drained soils formed in loess; on uplands

This map unit is mainly on gently rolling and rolling uplands (fig. 2) of the county. Areas of this unit are scattered throughout the uplands. Slope ranges from 0 to 40 percent.

This unit covers about 35 percent of the county. It is about 47 percent Alford soils, 17 percent Sylvan soils, and 36 percent soils of minor extent.

The nearly level to strongly sloping Alford soils are on the higher ridgetops and side slopes. They have a surface layer of dark brown silt loam and a subsoil of brown silt loam and silty clay loam. The gently sloping to very steep Sylvan soils are on the lower ridgetops, side slopes, and very steep breaks adjacent to drainageways. They have a surface layer of dark brown silt loam and a subsoil of dark yellowish brown, yellowish brown, and light olive brown silty clay loam and silt loam.

The minor soils in this unit are the somewhat poorly drained Wakeland soils on bottom lands; the steep and very steep, well drained Hickory soils on side slopes; and the moderately well drained, nearly level Iona soils on ridgetops.

The soils in this unit are used mainly for cultivated crops. The more steeply sloping soils are mostly used for hay and pasture or woodland. Surface runoff and erosion are the major hazards in use and management of this unit.

Most of the soils in this unit are suited to building sites, local roads and streets, and septic tank absorption fields. Slope is a restriction, however, on soils that are moderately sloping to very steep.

2. Selma-Armiesburg-Vincennes

Nearly level, poorly drained and well drained soils formed in outwash or alluvium; on terraces and bottom lands

This map unit is on terraces and bottom lands. The areas are large and occupy positions that parallel the White and Wabash Rivers. Slope ranges from 0 to 2 percent.

This unit covers about 23 percent of the county. It is about 25 percent Selma soils, 17 percent Armiesburg

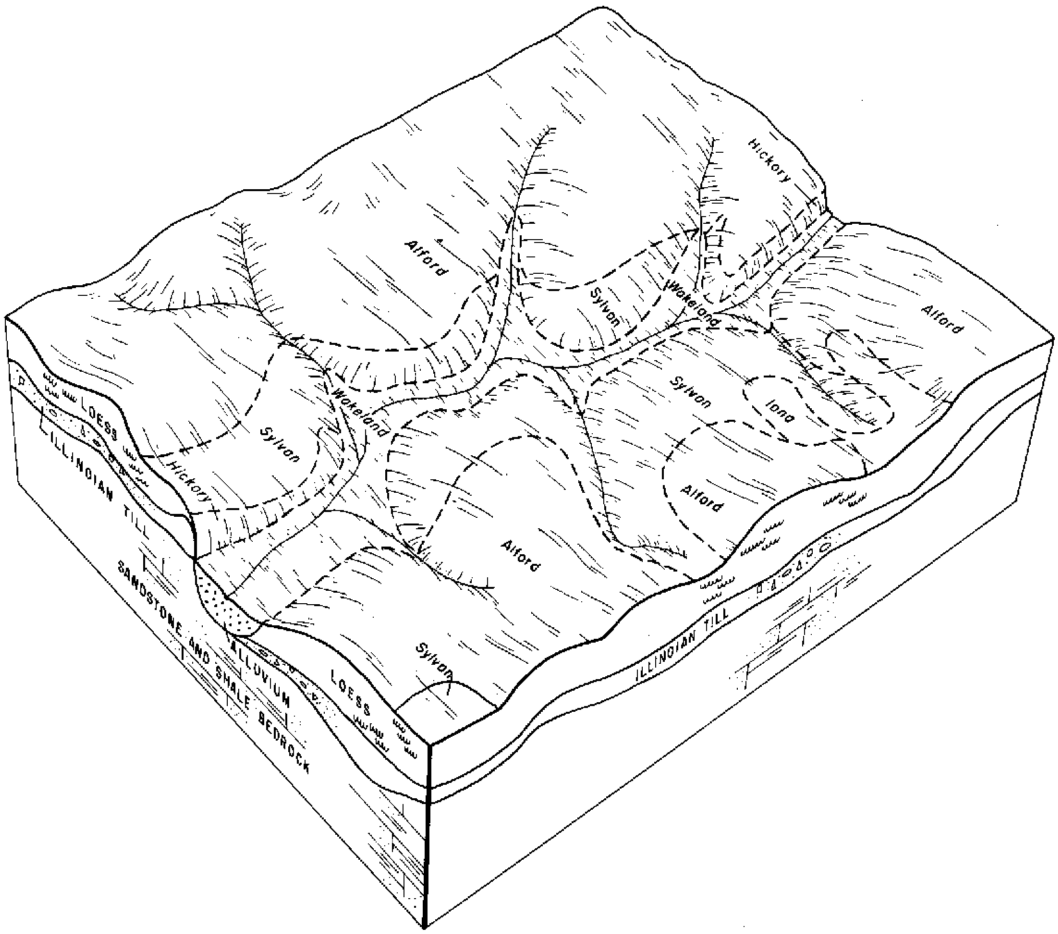


Figure 2.—Typical pattern of soils and underlying materials in the Alford-Sylvan general soil map unit.

soils, 12 percent Vincennes soils, and 46 percent soils of minor extent.

The poorly drained Selma soils are on broad flats and depressions. They have a surface layer of very dark gray loam or clay loam and a subsoil of dark gray, mottled sandy clay loam and clay loam.

The well drained Armiesburg soils are on broad bottom lands. They have a very dark grayish brown silty clay loam surface layer and a dark yellowish brown silty clay loam subsoil.

The poorly drained Vincennes soils have a dark gray or dark grayish brown loam or clay loam surface layer and a gray, mottled clay loam subsoil.

The minor soils in this unit are the very poorly drained Kings and Lyles soils and poorly drained Patton soils in depressions and along drainageways and the well drained Haymond, Landes, and Nolin soils on broad bottom lands.

The soils in this unit are used mainly for cultivated crops. A few undrained areas are in woodland. Except on Armiesburg soils, wetness is the main limitation in use and management. Armiesburg soils are well drained and have a hazard of flooding in winter and early spring. Most areas of Armiesburg soils are protected from flooding by levees.

The soils in this unit are not well suited to building sites, local roads and streets, and septic tank absorption fields because of the seasonal high water table and hazard of flooding.

3. Haymond-Nolin-Petrolia

Nearly level, well drained and poorly drained soils formed in alluvium; on bottom lands

This map unit is on bottom lands adjacent to the rivers and small streams throughout the county. Slope ranges from 0 to 2 percent.

This unit covers about 13 percent of the county. It is about 30 percent Haymond soils, 22 percent Nolin soils, 19 percent Petrolia soils, and 29 percent soils of minor extent.

The well drained Haymond soils are mostly in the broad areas closest to the larger streams. They have a surface layer of brown silt loam and a subsoil of dark yellowish brown and yellowish brown silt loam.

The well drained Nolin soils occupy slightly higher positions. They have a surface layer of dark brown silty clay loam and a subsoil of brown, yellowish brown, and dark yellowish brown silty clay loam and silt loam.

The poorly drained Petrolia soils are in depressions and old stream channels. They have a surface layer of dark grayish brown silty clay loam and a subsoil of gray, mottled silty clay loam.

The minor soils in this unit are the well drained Lomax soils on broad bottom lands; the poorly drained Birds soils in depressions on broad bottom lands; and the somewhat poorly drained Wakeland soils in creek bottoms along the smaller streams.

The soils in this unit are used mainly for cultivated crops. Flooding is the main hazard in use and management, but most areas are protected by levees. Petrolia soils have a wetness limitation in addition to the flooding hazard.

The soils in this unit are poorly suited to building sites, local roads and streets, and septic tank absorption fields because of flooding.

4. Hosmer-Sylvan

Nearly level to very steep, well drained soils formed in loess; on uplands

This map unit is mainly on gently rolling to rolling uplands (fig. 3). The steep and very steep areas are on side slopes adjacent to bottom land and terrace soils. Slope ranges from 0 to 40 percent.

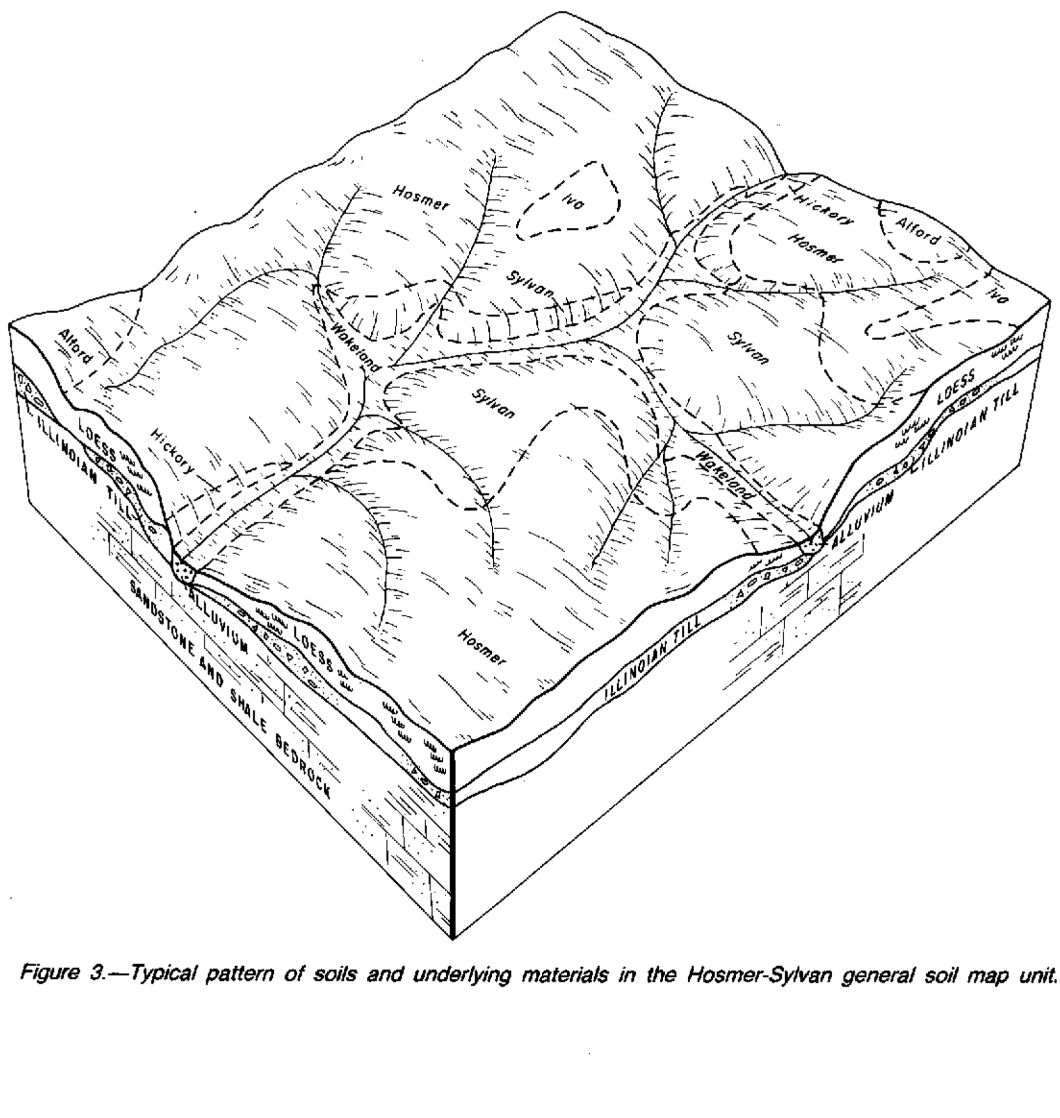


Figure 3.—Typical pattern of soils and underlying materials in the Hosmer-Sylvan general soil map unit.

This unit covers about 9 percent of the county. It is about 49 percent Hosmer soils, 15 percent Sylvan soils, and 36 percent soils of minor extent.

The nearly level to strongly sloping, well drained Hosmer soils are on the higher ridgetops and side slopes. These soils have a very slowly permeable fragipan. They have a surface layer of brown silt loam and a subsoil of yellowish brown silty clay loam and silt loam.

The gently sloping to very steep Sylvan soils are on the lower ridgetops, side slopes, very steep breaks, and toe slopes. They have a surface layer of dark brown silt loam and a subsoil of brown silt loam and silty clay loam.

The minor soils in this unit are the somewhat poorly drained Wakeland soils on bottom lands; the steep and very steep, well drained Hickory soils on side slopes adjacent to drainageways of the uplands; the nearly level to strongly sloping, well drained Alford soils on knolls in higher positions of the uplands; and the nearly level, somewhat poorly drained Iva soils on broad ridgetops.

The soils in this unit are used mainly for cultivated crops. The steeper slopes are used for hay and pasture or woodland. Surface runoff and erosion are the major hazards, and the very slow permeability of the Hosmer soils is the main limitation in use and management.

The nearly level to moderately sloping soils are suited to cultivated crops. Corn, soybeans, and small grains are the main crops. Conservation practices are needed to control runoff and erosion on the gently sloping and moderately sloping soils. Soil loss can be reduced by crop rotation, conservation tillage, terraces, contour farming, grassed waterways, and grade stabilization structures.

The strongly sloping soils are best suited to grasses and legumes for hay and pasture. Erosion is the major hazard in use and management. Alfalfa and other deep-rooted crops are not suited to Hosmer soils because of the fragipan. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth.

The steep and very steep soils are suitable for trees. Most areas are in native hardwoods. Slope restricts the use of logging equipment, and erosion is a hazard along logging roads and trails.

Most of the soils in this unit are suited to building sites and local roads and streets, but slope is a limitation on soils that are moderately sloping to very steep. The Hosmer soils and the moderately sloping to very steep soils are poorly suited to septic tank absorption fields because of the slope and very slow permeability.

5. Alvin-Bloomfield-Ayrshire

Nearly level to strongly sloping, well drained, somewhat excessively drained, and somewhat poorly drained soils formed in eolian deposits; on uplands

This map unit is mainly on nearly level to rolling hummocky uplands (fig. 4). Slope ranges from 0 to 18 percent.

This unit covers about 8 percent of the county. It is about 41 percent Alvin soils, 29 percent Bloomfield soils, 20 percent Ayrshire soils, and 10 percent soils of minor extent.

The gently sloping to strongly sloping, well drained Alvin soils are on ridgetops, side slopes, and dunelike areas of the uplands. They have a surface layer of brown fine sandy loam and a subsoil of dark yellowish brown and strong brown sandy loam and fine sandy loam.

The gently sloping to strongly sloping, somewhat excessively drained Bloomfield soils are on higher ridgetops and short irregular slopes. They have a surface layer of brown loamy fine sand and a subsoil of yellowish brown and dark brown, banded loamy sand and fine sandy loam.

The nearly level, somewhat poorly drained Ayrshire soils are in slight depressions and nearly level ridgetops. They have a surface layer of brown fine sandy loam and a subsoil of grayish brown and gray, mottled loam, clay loam, sandy clay loam, and sandy loam.

The minor soils in this unit are the nearly level, very poorly drained Lyles soils in depressions; the gently sloping and moderately sloping, excessively drained Chelsea soils on outwash terraces; and the nearly level, somewhat poorly drained Wakeland soils on bottom lands.

The soils in this unit are used mainly for cultivated crops. Many areas of Alvin and Bloomfield soils are used for orchards, melons, and other specialty crops. Some areas are in pasture or woodland. Erosion is a hazard on the gently sloping to sloping soils. Drought is a limitation on the well drained and somewhat excessively drained soils.

Most of the soils in this unit are suited to building sites and local roads and streets. Their use for septic tank absorption fields is severely limited by the rapid permeability, wetness, and slope.

6. Stockland-Conotton-Elston

Nearly level and gently sloping, well drained soils formed in glacial outwash deposits; on terraces and outwash plains

This map unit is mainly on gently undulating terraces. The areas are large and border lower terraces. Slope ranges from 0 to 3 percent.

This unit covers about 8 percent of the county. It is about 24 percent Stockland soils, 22 percent Conotton soils, 15 percent Elston soils, and 39 percent soils of minor extent.

The nearly level Stockland soils have a surface layer of black sandy loam and a subsoil of dark brown and brown very gravelly sandy loam, gravelly sandy loam, and gravelly loamy sand.

The nearly level and gently sloping Conotton soils have a surface layer of dark brown sandy loam and a

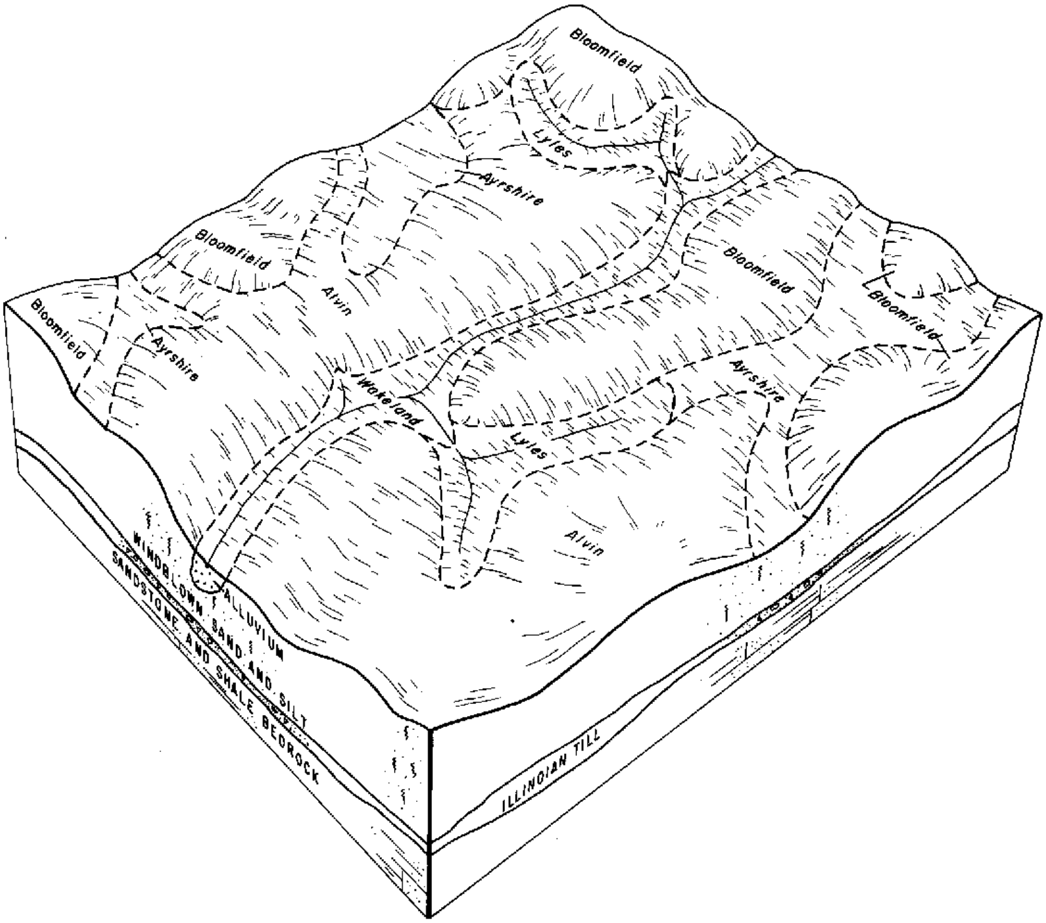


Figure 4.—Typical pattern of soils and underlying materials in the Alvin-Bloomfield-Ayrshire general soil map unit.

subsoil of dark brown and reddish brown sandy loam, very gravelly and gravelly sandy clay loam, and gravelly sandy loam.

The nearly level and gently sloping Elston soils have a surface layer of very dark brown sandy loam and a subsoil of dark yellowish brown and dark brown sandy loam, loamy sand, and coarse sand.

The minor soils in this unit are the poorly drained Selma, Vincennes, and Zipp soils in depressions along old drainage channels and the somewhat excessively drained Ade soils on knolls.

The soils in this unit are used mainly for cultivated crops. Corn, soybeans, and small grains are the main crops. A few areas are used for vegetable crops. The moderate or low available water capacity is the main limitation.

This unit is suitable for building sites, local roads and streets, and septic tank absorption fields. Seepage of effluent, however, could pollute ground water supplies on the Conotton soils because of their poor filtering capacity.

7. Reesville-Ragsdale

Nearly level, somewhat poorly drained and very poorly drained soils formed in loess; on uplands

This map unit is on upland flats and depressions. Slope ranges from 0 to 2 percent.

This unit covers about 4 percent of the county. It is about 47 percent Reesville soils, 40 percent Ragsdale soils, and 13 percent soils of minor extent.

The somewhat poorly drained Reesville soils are on broad flats of the ridgetops. They have a surface layer of dark grayish brown silt loam and a subsoil of dark yellowish brown and light olive brown, mottled silty clay loam and silt loam.

The very poorly drained Ragsdale soils are in depressions. They have a surface layer of very dark grayish brown silt loam and a subsoil of grayish brown and yellowish brown, mottled silty clay loam.

The minor soils in this unit are the poorly drained Patton soils on lacustrine terraces; the moderately well drained Iona soils on nearly level ridgetops; and the well drained, gently sloping Sylvan soils on slight rises and side slopes in the landscape.

This unit is used mainly for cultivated crops. Most areas have been drained. Wetness is the main limitation for farming and most other uses. In winter and early spring, ponding is common in depressions.

Wetness is a severe limitation for building sites, local roads and streets, and septic tank absorption fields.

broad land use considerations

The general soil map is helpful in locating, comparing, and selecting large areas for major kinds of land use. Additional information is needed, however, for selecting sites for specific urban structures.

The Alford-Sylvan general soil map unit and Hosmer-Sylvan general soil map unit are suited to general farming. Surface runoff and erosion are the major hazards in use and management. The nearly level to moderately sloping soils in these units are well suited to cultivated crops, but erosion control practices are needed. The strongly sloping to very steep soils are generally unsuitable for cultivated row crops because of the slope and the severe hazard of erosion. They are better suited to hay and pasture or woodland. These map units are mostly suited to urban uses but are limited by the very slow permeability of the Hosmer soils and the steepness of some of the other soils.

The Haymond-Nolin-Petrolia map unit is on flood plains, and flooding is a severe hazard in most areas not protected by levees. Drainage is needed on Petrolia soils. This unit is well suited to cultivated crops but poorly suited to urban uses.

The Selma-Armiesburg-Vincennes map unit and Reesville-Ragsdale map unit are well suited to cultivated crops but poorly suited to urban uses. An extensive drainage system is needed on all soils in these units except Armiesburg soils. Most areas of the Armiesburg soils are protected from flooding by levees.

Many areas of the Alvin-Bloomfield-Ayrshire map unit and the Stockland-Conotton-Elston map unit are used for cultivated crops, orchards, melons, and irrigated vegetable crops. Alvin soils and Bloomfield soils are well suited to orchards and melon crops. The less sloping areas of these soils are suited to urban uses. Ayrshire soils are suited to cultivated crops but, because of wetness, are poorly suited to urban uses. The Stockland-Conotton-Elston unit is suited to cultivated crops, vegetable crops, and urban uses. Medium or low available water capacity is the main limitation. The soils in this unit are underlain with a source of water suitable for irrigation, and some areas are being irrigated and used for corn and soybeans as well as vegetable crops.

Most soils in the county are suited to woodland. The steeper soils in the Alford-Sylvan map unit and Hosmer-Sylvan map unit are important for commercial wood production. Commercially valuable trees are less common and generally do not grow as well on the wetter Ayrshire soils, Reesville soils, and Ragsdale soils. Soils in the Stockland-Conotton-Elston map unit are poorly suited to woodland.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. The map units that are considered prime farmland are identified in a separate section following the last soil description. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alford silt loam, 6 to 12 percent slopes, eroded, is one of several phases in the Alford series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Dumps, mine, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Descriptions, names, and delineations of soils in this survey do not fully agree with those in surveys of adjacent counties. This is a result of different intensities of mapping and extents of the soils. Composition of the map units also varies from one county to another. Sometimes it was feasible to combine small acreages of similar soils that respond to use and management in much the same way.

soil descriptions

AdB—Ade loamy fine sand, 2 to 6 percent slopes. This gently sloping, somewhat excessively drained soil is on short, irregular slopes and narrow ridgetops in hummocky areas of the uplands and terraces. Map units are small and irregular in shape and range from 2 to 20 acres in size.

In a typical profile the surface layer is very dark gray loamy fine sand about 10 inches thick. The subsurface layer, about 22 inches thick, is very dark grayish brown loamy fine sand in the upper part and brown fine sand in the lower part. Below this, to a depth of 65 inches, is yellowish brown fine sand that contains bands of brown loamy fine sand. The substratum, to a depth of 70 inches, is pale brown fine sand.

Included with this soil in mapping are lower areas of very poorly drained Lyles soils. These inclusions make up about 5 percent of the unit.

This Ade soil has a low available water capacity and rapid permeability. The organic matter content is high. Surface runoff is slow. The surface layer is friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some are used for hay or pasture, and some are used for peach and apple orchards.

This soil is suited to melons, corn, soybeans, grain sorghum, small grain, and hay and pasture. The low available water capacity is a limitation. During years of below average or poorly distributed rainfall, crops are subject to severe damage from drought. Sprinklers are used to irrigate many areas, and crop yields have increased appreciably. Using conservation tillage in which all or part of the crop residue is left on the surface and planting early in spring help to overcome the potential damage from drought. Cover crops also help control soil blowing and erosion and improve and maintain organic matter content of this soil.

The use of this soil for hay or pasture is also effective in controlling soil blowing and erosion. Proper stocking rates and pasture rotation will help keep the pasture and soil in good condition.

This soil has a slight limitation for building sites and local roads and streets and a severe limitation for septic tank absorption fields. Although sewage effluent is readily absorbed into the soil, pollution of ground water may become a problem.

This soil is in capability subclass IIIs. It has not been assigned to a woodland suitability subclass.

AlA—Alford silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on broad flats in the uplands. The map units are irregular in shape and range from 10 to 200 acres in size.

In a typical profile the surface layer is brown silt loam about 6 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil, to a depth of about 80 inches, is brown, strong brown, and yellowish brown, firm silty clay loam and yellowish brown, friable silt loam. In some places the soils are mottled below a depth of 30 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Iva soils at the heads of small drainageways. These inclusions make up 4 to 10 percent of the unit.

This Alford soil has a very high available water capacity and moderate permeability. The organic matter content of the surface layer is moderate. Surface runoff is slow. The surface layer is friable and easily tilled over a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some are used for hay and pasture, and a few are used for orchards or woodland.

This soil is well suited to corn, soybeans, and small grains. Conservation tillage that leaves all or part of the crop residues on the surface, cover crops, and green manure crops improve organic matter content and maintain good soil tilth.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet damages the sod, reduces plant densities, reduces forage yields, and causes surface compaction and poor soil tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. Plant competition is moderate, but seedlings survive and grow well when competing vegetation is controlled by site preparation or by cutting, spraying, or girdling.

This soil has moderate limitations for building sites. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarser material helps prevent structural damage caused by shrinking and swelling of the soil. This soil is limited for local roads and streets by frost action and low strength. The base material for roads will need strengthening or replacing by more suitable material to support vehicular traffic. This soil is suitable for septic tank absorption fields.

This soil is in capability class I and woodland suitability subclass 1o.

AlB2—Alford silt loam, 2 to 6 percent slopes, eroded. This gently sloping, well drained soil is on broad convex ridgetops, long side slopes, and toe slopes of the uplands. Areas are usually broad and irregular in shape and range from 2 to 100 acres in size.

In a typical profile the surface layer is dark brown silt loam about 6 inches thick. The brown subsoil, to a depth of about 80 inches, is friable silt loam in the upper part, firm silty clay loam in the middle part, and friable silt loam in the lower part. Some areas have slopes greater than 6 percent. In a few small areas, the subsoil is mottled below a depth of 30 inches.

Included with this soil in mapping are small areas of very slowly permeable Hosmer soils and small areas of somewhat poorly drained Iva soils in lower areas. These inclusions make up 6 to 12 percent of the unit.

This Alford soil has a very high available water capacity and moderate permeability. The organic matter content is moderate. Surface runoff from cultivated areas is medium. The surface layer is friable and easily tilled over a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some are used for hay and pasture, and a few are used for orchards or woodland.

This soil is well suited to corn, soybeans, and small grain. Conservation practices are needed to control erosion when cultivated crops are grown (fig. 5). Soil loss can be reduced by crop rotation, conservation tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures. Crop residue left on or in the surface layer (fig. 6) and cover crops also help to control erosion and maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotations are essential to keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. It is limited to a moderate degree by plant competition. Seedlings survive and grow well, however, if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

Figure 5.—Alford silt loam, 2 to 6 percent slopes, eroded, needs erosion control measures when it is used for row crops.

This soil has moderate limitations for building sites because of its high shrink-swell potential. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarse material helps prevent structural damage caused by shrinking and swelling. Low strength and a high potential for frost action are severe limitations for local roads and streets. The base material will need strengthening or replacing by more suitable material to support vehicular traffic. This soil is suitable for septic tank absorption fields.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

AlC2—Alford silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, well drained soil is on side slopes below ridgetops and side slopes adjacent to drainageways of the uplands. Areas are small and irregular in shape and range from 2 to 60 acres in size.

In a typical profile the surface layer is dark brown silt loam about 6 inches thick. The subsoil is about 65 inches thick. The upper part of the subsoil is brown, firm silty clay loam and the lower part is brown, friable silt loam. The substratum, to a depth of 75 inches, is brown silt loam. In some areas the lower part of the subsoil and the substratum are brown, mottled silt loam. Slopes greater than 12 percent and less than 6 percent are in some places.

Included with this soil in mapping are small areas of somewhat poorly drained Iva soils at the heads of drainageways. A few areas of very slowly permeable Hosmer soils are included at the base of side slopes. A few areas of severely eroded soils that have a higher clay content in the surface layer are included. These inclusions make up 8 to 12 percent of the unit.

This Alford soil has a very high available water capacity and moderate permeability. The organic matter content is moderate. Surface runoff from cultivated areas is medium. The surface layer is friable and easily tilled over a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some are

Figure 6.—Soybeans planted in wheat stubble is one effective way of controlling erosion as well as conserving moisture on Alford silt loam, 2 to 6 percent slopes, eroded.

used for hay and pasture, and a few are used for orchards or woodland.

This soil is suited to corn, soybeans, and small grain. Conservation practices are needed to control erosion when cultivated crops are grown. Soil loss can be reduced by crop rotation, conservation tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures. Leaving the crop residue on or in the surface layer and cover crops also help to control erosion and maintain and improve the tilth and organic matter content of this soil.

The use of this soil for grasses and legumes for hay and pasture is also effective in controlling soil blowing and water erosion. Overgrazing reduces plant densities, and grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotations are essential to keep the pasture and soil in good condition.

This soil is well suited to trees, but is moderately limited by plant competition. Seedlings survive and grow well if the competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil has a moderate limitation for building sites. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarser material helps prevent structural damage caused by shrinking and swelling of the soil. Buildings should be designed to complement slopes or grading must be done to modify slopes. Removal of vegetation should be kept to a minimum and exposed areas seeded or sodded as soon as possible. Frost action and low strength are severe limitations for local roads and streets. The base material for local streets and roads must be strengthened with a more suitable material to support vehicular traffic. Slope is a moderate limitation for septic tank absorption fields. Land shaping and installing the distribution lines across the slope is generally necessary for proper functioning of the absorption field.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

AlD3—Alford silt loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, well drained soil is on side slopes below ridgetops and adjacent to drainageways of the uplands. Areas are usually long and irregular in shape. They range from 4 to 60 acres in size.

In a typical profile the surface layer is yellowish brown silt loam about 4 inches thick. The subsoil is yellowish brown and strong brown, firm silty clay loam and silt loam about 60 inches thick. The substratum, to a depth of 70 inches, is brown and yellowish brown silt loam. In some places the lower part of the subsoil and the substratum is yellowish brown, mottled silt loam. A few areas have till or outwash materials in the lower part of the subsoil and in the underlying material. Small areas of moderately sloping soils are at the heads of drainageways.

Included with this soil in mapping are small areas of very slowly permeable Hosmer soils on side slopes. A few long narrow areas of somewhat poorly drained Wakeland soils adjacent to drainageways are also included. These inclusions make up about 6 to 10 percent of the unit.

This Alford soil has a very high available water capacity and moderate permeability. The organic matter content is low because the surface layer has been eroded. Surface runoff from cultivated areas is very rapid. The surface layer is firm. Restricting tillage to a narrow range in moisture content reduces compaction and clodding.

Some of this soil is cultivated, and some is in woodland. Other areas are used for grasses and legumes for hay or pasture. A few areas are in orchards.

This soil is generally unsuitable for cultivated crops because of the very severe hazard of further erosion. Small grain is occasionally grown so that stands of grasses and legumes can be reestablished.

This soil is suited to grasses and legumes for forage and pasture. Some areas are often left in grass because of the difficulty in establishing seedlings. When this soil is used for pasture, overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and many areas are in woodland. This soil is limited to a moderate degree by plant competition. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil has severe limitations for building sites. Slopes must be modified, and buildings should be designed to complement slopes. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarser material helps prevent structural damage caused by shrinking and swelling of the soil. Removal of vegetation should be kept to a minimum, and disturbed areas should be sodded or reseeded promptly. Low strength, slope, and frost action are severe limitations for local roads and streets. Cuts and fills are needed, and roads should be built on the contour where possible. This soil must be strengthened with more suitable base material if roads are to support vehicular traffic. It has a severe limitation for septic tank absorption fields. Land shaping and installing the distribution lines across the slope is generally necessary for proper functioning of absorption fields.

This soil is in capability subclass VIe and woodland suitability subclass 1o.

AnB—Alvin fine sandy loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on ridgetops, side slopes, and dunelike areas of the uplands. Areas are elongated and irregular in shape and range from 8 to 60 acres in size.

In a typical profile the surface layer is brown fine sandy loam about 8 inches thick. The subsoil is dark yellowish brown and strong brown, friable sandy loam and fine sandy loam about 46 inches thick. There are bands of loamy fine sand in the lower part. The substratum, to a depth of 60 inches, is dark yellowish brown loamy sand with bands of fine sandy loam. Some areas are underlain with layers of coarse silt. There are small areas that have a loamy fine sand surface layer and a sandy loam subsoil. A few areas have a browner, more clayey surface layer.

Included in mapping are small areas of nearly level, somewhat poorly drained Ayrshire soils on ridgetops and small areas of very poorly drained Lyles soils adjacent to drainageways. These inclusions make up 10 to 12 percent of the unit.

This Alvin soil has a moderate available water capacity and moderate permeability. The organic matter content is low, and surface runoff is medium. The surface layer is very friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some are used for hay and pasture, and a few are used for orchards, melons, or woodland.

This soil is well suited to corn, soybeans, and small grain. The moderate available water capacity is a limitation. During years when rainfall is below average or poorly distributed, crops are subject to damage from drought. Use of minimum tillage and leaving all or part of the crop residue on or in the surface layer and planting early in spring help to reduce the potential damage to crops from drought. Conservation practices such as crop rotation, conservation tillage that leaves the crop residue on or in the surface layer, terraces, diversions, contour farming, grassed waterways or grade stabilization structures, and cover crops help to control erosion and maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. It is moderately limited by plant competition, but seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil has a slight limitation for building sites. Frost action and low strength are moderate limitations for local roads and streets. This soil must be strengthened with more suitable base material if it is to support vehicular traffic. It is suitable for septic tank absorption fields.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

AnC—Alvin fine sandy loam, 6 to 12 percent slopes. This moderately sloping, well drained soil is on short irregular slopes of the uplands. Areas are elongated and irregular in shape and range from 5 to 50 acres in size.

In a typical profile the surface layer is brown fine sandy loam about 7 inches thick. The subsoil is brown, friable fine sandy loam and sandy loam about 35 inches thick. The substratum, to a depth of 60 inches, is yellowish brown and pale brown fine sand. Some small areas on knolls and near drainageways have a browner, more clayey surface layer. There are small areas that have a loamy fine sand surface layer. Some places have slopes greater than 12 percent.

Included in mapping are small areas of somewhat poorly drained Ayrshire soils and poorly drained Lyles soils in lower positions and adjacent to small drainageways. These inclusions make up 8 to 10 percent of the unit.

This Alvin soil has a moderate available water capacity and moderate permeability. The organic matter content is low. Surface runoff is medium. The surface layer is very friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some are used for hay and pasture, and a few are used for orchards, melons, and woodland.

This soil is well suited to corn, soybeans, and small grain. The moderate available water capacity is a limitation. During years when rainfall is below average or poorly distributed, crops are subject to damage from drought. Use of conservation tillage that leaves all or part of the crop residue on or in the surface layer and planting early in spring help to reduce the potential damage to crops from drought. Conservation practices such as crop rotation, conservation tillage that leaves the crop residue on or in the surface layer, diversions, contour farming, grassed waterways or grade stabilization structures, and cover crops help to control erosion and maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and the soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. This soil is moderately limited by the hazard of plant competition. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

Slope is a moderate limitation for building sites. Buildings should be designed to complement slopes, or grading done to modify slopes. Topsoil from disturbed areas should be replaced and the area replanted as soon as possible after construction. Frost action, slope, and low strength are moderate limitations for local roads and streets. This soil must be strengthened with more suitable base material if it is to support vehicular traffic. Slope is a moderate limitation for septic tank absorption fields. Land shaping and installing the distribution lines across the slope is generally necessary for proper functioning of absorption fields.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

AnD—Alvin fine sandy loam, 12 to 18 percent slopes. This strongly sloping, well drained soil is on short irregular side slopes of drainageways of the uplands. Areas are long and irregular in shape and range from 4 to 30 acres in size.

In a typical profile the surface layer is brown fine sandy loam about 6 inches thick. The subsoil is brown, friable fine sandy loam and sandy loam about 35 inches thick. The substratum, to a depth of 60 inches, is yellowish brown and pale brown fine sand. Some small areas at the crest of the knolls and near drainageways have a browner, more clayey surface layer.

Included with this soil in mapping are small areas of nearly level, somewhat poorly drained Ayrshire soils and small areas of very poorly drained Lyles soils in depressions and adjacent to drainageways. These inclusions make up about 5 to 7 percent of the unit.

This Alvin soil has a moderate available water capacity and moderate permeability. The organic matter content is low. Surface runoff is rapid. The surface layer is very friable and easily tilled over a wide range in moisture content.

Some areas are in cultivated crops, and some are in woodland. Other areas are used for grasses and legumes for hay and pasture. A few areas are in orchards.

This soil is poorly suited to corn, soybeans, and small grain because of the very severe hazard of erosion. Most row crops are grown so that stands of grasses and legumes can be reestablished. The moderate available water capacity is a limitation. During years when rainfall is below average or poorly distributed, crops are subject to damage from drought. Using conservation tillage that leaves all or part of the crop residue on the surface and planting early in spring help to overcome the potential damage to crops from drought. Conservation practices are needed to control erosion and surface runoff when this soil is cropped. Soil loss can be reduced by conservation tillage, diversions, grassed waterways, and leaving the crop residue on the soil surface. Crop rotations that include the growing of grasses and legumes for hay and pasture most of the time are most effective in reducing runoff and controlling erosion.

This soil is well suited to grasses and legumes for hay and pasture. Areas of this soil are often left in grass when surrounding areas are cultivated because it is an effective way of preventing erosion. When this soil is used for pasture, overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and many areas are in woodland. It is moderately limited by plant competition, but seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

Slope is a severe limitation for building sites. Slopes must be modified and buildings should be designed to complement slopes. Topsoil from disturbed areas should be replaced and the area replanted as soon as possible after construction. Slope is a severe limitation for local roads and streets. Cuts and fills are needed, and roads should be built on the contour where possible. This soil must be strengthened with more suitable base material if roads are to support vehicular traffic. Slope is a severe limitation for septic tank absorption fields. Land shaping and installing the distribution lines across the slope is generally necessry for proper functioning of the absorption field.

This soil is in capability subclass IVe and woodland suitability subclass 2r.

Ar—Armiesburg silty clay loam, rarely flooded. This nearly level, well drained soil is on broad bottom lands. It is flooded for brief periods of time. Areas are irregular in shape and range from 50 to 200 acres in size.

In a typical profile the surface layer is very dark grayish brown silty clay loam about 8 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 8 inches thick. The subsoil is dark brown and yellowish brown, firm silty clay loam about 22 inches thick. The substratum, to a depth of about 60 inches, is brown, mottled silty clay loam. In some areas this soil has a brown silt loam surface layer, 6 to 12 inches thick, of recent overwash material.

Included with this soil in mapping are elongated, narrow areas of poorly drained Petrolia soils in depressions that were former drainage channels. These inclusions make up about 8 percent of the unit.

This Armiesburg soil has a high available water capacity and moderate permeability. It has a high organic matter content in the surface layer. Surface runoff is very slow. This soil has a friable surface layer that is easily tilled over a moderate range in moisture content. Tillage operations when the soil is too wet results in cloddy seedbeds.

Most areas are farmed, mostly for cultivated crops. Some areas are used for pasture or woodland.

This soil is best suited to corn and soybeans because they can be planted and harvested during the period of least flooding, especially in areas not protected by levees. Flooding is a hazard in use and management of this soil. Most areas are protected by levees but seepage through levees during periods of high water causes flooding in some of the lower areas. Alfalfa and small grain occasionally drown out in winter and early spring months in these areas. With flood protection and proper management this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. Alfalfa is subject to severe damage in areas not protected by levees. Overgrazing and grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferments of grazing and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is suited to trees, and some areas are in hardwoods. It is moderately limited by plant competition, but seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil is generally unsuitable for building sites and sanitary facilities because of flooding. Low strength and high potential for frost action are severe limitations for local roads and streets. This soil should be strengthened or replaced by more suitable base material if it is to support vehicular traffic.

This soil is in capability class I and woodland suitability subclass 1o.

Ay—Ayrshire fine sandy loam. This nearly level, somewhat poorly drained soil is in slight depressions and nearly level uplands adjacent to well drained sandy soils. Areas are irregular in shape and range from 4 to 30 acres in size.

In a typical profile the surface layer is brown fine sandy loam about 7 inches thick. The subsurface layer is grayish brown, mottled fine sandy loam about 2 inches thick. The mottled subsoil is about 46 inches thick. It is brown, friable loam in the upper part; grayish brown and gray firm clay loam, sandy clay loam, and sandy loam in the lower part. The underlying material, to a depth of 60 inches, is light brownish gray, mottled loamy sand with layers of silt. In some slightly concave areas, this soil has a dark gray, mottled surface layer and a grayer subsoil. In a few areas at the base of more sloping soils the surface layer is loamy sand and the subsoil is sandy loam. In some areas on crests of narrow ridges the subsoil layers are browner.

Included in mapping are small convex areas of somewhat excessively drained Bloomfield soils and well drained Alvin soils and small areas of Lyles soils in depressions. Also included are small areas of soils along Marsh Creek east of Oaktown that contain shale and sandstone bedrock at a depth of 20 to 40 inches. These areas are at the base of steeper soils. These inclusions make up 10 to 15 percent of the unit.

This Ayrshire soil has a high available water capacity and moderately slow permeability. The organic matter content is moderate, and surface runoff is slow. This soil has a seasonal high water table at a depth of 1 to 3 feet during winter and early spring. The surface layer is friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Most areas are drained by subsurface drains or surface drains and used for corn, soybeans, and small grain. Some areas are in grass or legumes and used for hay or pasture. Few areas are in woodland.

When drained, this soil is well suited to corn, soybeans, small grain, and hay and pasture. Wetness is the major limitation. If adequately drained, a conservation cropping system can be used that includes row crops most of the time. Random tile can reduce wetness in lower areas that collect runoff. Conservation tillage that leaves all or part of the crop residue on the surface and cover crops help to maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. It is moderately limited by plant competition, but seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

The seasonal high water table is a severe limitation for building sites. Areas used for this purpose must be artificially drained to control the excess water. Dwellings should be constructed without basements. There are severe limitations for local roads and streets. Drainage ditches along roads can lower the water table and help prevent damage caused by frost action. The base material for roads and streets will need replacing or strengthening by more suitable material to support vehicular traffic. The seasonal high water table and moderately slow permeability are severe limitations for septic tank absorption fields. In areas where commercial sewers are not available, larger absorption fields have been used to help overcome the moderately slow permeability and drainage systems installed to lower the seasonal high water table.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

Bd—Birds silt loam. This nearly level, poorly drained soil is mostly on broad, slightly concave flood plains adjacent to lacustrine soil areas. It is rarely flooded for long periods in spring. Frequently flooded areas are commonly near Wakeland soils in lower creek bottoms away from drainage channels adjacent to uplands. Areas range from 10 to 70 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 7 inches thick. The underlying material, to a depth of 60 inches, is gray, mottled silt loam with layers of silty clay loam. In some areas the subsurface layers are medium or strongly acid. Some areas have a dark grayish brown or brown recent overwash deposit, 6 to 8 inches thick, on the original surface layer. A few areas adjacent to small streams are browner.

Included in mapping are a few areas of poorly drained Patton soils and very poorly drained Zipp soils along the edges of this unit. These inclusions make up 6 to 10 percent of the unit.

This Birds soil has a high available water capacity and moderately slow permeability. The organic matter content is moderate. Surface runoff is slow. The seasonal high water table is within 3 feet of the surface during winter and early in spring. The surface layer is friable and is easily tilled over a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some are used for hay, pasture, or woodland.

Unless drained, this soil is poorly suited to corn, soybeans, and small grain. Wetness is a major limitation, and flooding is a major hazard in use and management. Adequate drainage is difficult to establish because suitable outlets are not available in many places. With proper drainage a conservation cropping system that includes row crops most of the time can be used. Crops must often be replanted because flooding and surface water have destroyed stands. Other conservation practices such as cover crops and conservation tillage that leaves all or part of the crop residue on the surface will help maintain and improve the organic matter content and tilth of this soil.

This soil is well suited to grasses for hay and pasture and poorly suited to deep-rooted legumes such as alfalfa because of wetness and damage during periods of flooding. Drainage of this soil is also necessary for high yields of grasses and legumes. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the soil in good condition.

This soil is suited to trees, and some areas are in hardwoods. The limitation for the use of equipment is severe. This soil is severely limited by plant competition, and there are moderate hazards of seedling mortality and windthrow. Harvesting and planting operations are delayed until drier periods of the year. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, and girdling. Trees that can tolerate wet conditions are best suited to this soil.

The high water table and hazard of flooding are severe limitations for building sites and septic tank absorption fields, and this soil is generally unsuited for these uses. Frost action, flooding, and wetness are severe limitations for local roads and streets. Sites on nearby upland soils should be considered for all nonfarm uses.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

BlB—Bloomfield loamy fine sand, 2 to 10 percent slopes. This gently sloping and moderately sloping, somewhat excessively drained soil is on short, irregular slopes and narrow ridgetops on hummocky uplands and terraces. Areas are irregular in shape and range from 5 to 60 acres in size.

In a typical profile the surface layer is brown loamy fine sand about 9 inches thick. The subsurface layer is brown loamy sand 21 inches thick. The upper part of the subsoil is yellowish brown, friable loamy sand that contains thin bands of dark brown, firm sandy loam; the lower part, to a depth of 80 inches, is dark brown, firm sandy loam with bands of yellowish brown, friable loamy sand. The bands are 1/8 inch to 5 inches thick and 1/4 inch apart and in some areas have been exposed by erosion and soil blowing. The depth to the banded material is less on the windward side of slopes than on the leeward side.

Included with this soil in mapping are a few areas of very poorly drained Lyles soils in depressions and a few areas of somewhat poorly drained Ayrshire soils on nearly level slopes. These inclusions make up about 6 to 8 percent of the unit.

This Bloomfield soil has a low available water capacity and moderately rapid permeability. The organic matter content is moderate. Surface runoff is slow or medium. The surface layer is very friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for hay or pasture, and some are used for peach and apple orchards.

This soil is suited to melons, corn, soybeans, grain sorghum, small grain, and hay and pasture. The low available water capacity is a limitation. During years of below average or poorly distributed rainfall, crops are subject to severe damage from drought. Use of conservation tillage that leaves all or part of the crop residue on or in the surface layer and planting early in spring help to overcome the potential damage to crops from drought. Sprinklers are used to irrigate many areas, and crop yields have increased appreciably. The use of cover crops and leaving the crop residues on the surface help to control soil blowing and erosion and maintain and improve the organic matter content of this soil.

The use of this soil for grasses and legumes for hay or pasture is also effective in controlling soil blowing and erosion. Proper stocking rates and pasture rotation will help keep the pasture and soil in good condition.

This soil is suited to trees but is moderately limited by seedling mortality. Planting should be done early in spring to help reduce damage from drought. Replanting of some seedlings may be necessary to establish good stands.

This soil has a slight limitation for building sites and local roads and streets and a severe limitation for septic tank absorption fields. Although sewage effluent is readily absorbed into the soil, pollution of ground water may become a problem.

This soil is in capability subclass IVs and woodland suitablity subclass 3s.

BlD—Bloomfield loamy fine sand, 12 to 18 percent slopes. This strongly sloping, somewhat excessively drained soil is on short side slopes of drainageways and short, irregular slopes on hummocky uplands. Areas are long and narrow and irregular in shape and range from 3 to 20 acres in size.

In a typical profile the surface layer is brown loamy fine sand about 8 inches thick. The subsurface layer is yellowish brown loamy sand about 27 inches thick. The subsoil is yellowish brown, loose loamy sand that has discontinuous bands of dark brown, friable sandy loam and is about 36 inches thick. The bands are 1/8 inch to 4 inches thick and 1 to 4 inches apart. The underlying material, to a depth of 80 inches, is light yellowish brown and yellowish brown fine sand. In some places the banded material has been exposed by soil blowing and erosion. The depth to banded material is less on the windward side of slopes than on the leeward side.

Included in mapping are small narrow areas of very poorly drained Lyles soils and somewhat poorly drained Ayrshire soils adjacent to drainage channels. These inclusions make up 3 to 6 percent of the unit.

This Bloomfield soil has a low available water capacity and moderately rapid permeability. The organic matter content is moderate. Surface runoff is medium. The surface layer is very friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for hay and pasture, and others are in orchards.

This soil is poorly suited to corn, soybeans, and grain sorghum because of the hazard of erosion. The low available water capacity is also a limitation. During years of below average or poorly distributed rainfall, crops are subject to severe damage from drought. If used for crops, conservation tillage that leaves all the crop residue on the surface and planting early in spring help to overcome the potential damage to crops from drought. Soil loss can be reduced by crop rotation, terraces, diversions, contour farming, grassed waterways, and grade stabilization structures. The use of cover crops and leaving all crop residues on the surface help to control soil blowing and erosion and maintain and improve the organic matter content of this soil.

The use of this soil for grasses and legumes for hay or pasture is also effective in controlling soil blowing and erosion. Proper stocking rates and pasture rotation will help keep the pasture and soil in good condition.

This soil is suited to trees but is moderately limited by a hazard of seedling mortality. Planting seedlings early in spring helps them become established before drier periods. Some replanting of seedlings is usually necessary.

Slope is a moderate limitation for building sites and local roads and streets. Building sites require extensive grading and shaping to modify slopes, or else buildings should be designed to complement existing slopes. Topsoil from disturbed areas should be replaced and then replanted as soon as possible after construction. Designs to complement slopes and extensive cuts and fills are required for satisfactory grades on local roads and streets. Limitations for septic tank absorption fields are severe because the soil is a poor filter. Seepage of effluent into ground water supplies may become a problem.

This soil is in capability subclass VIs and woodland suitability subclass 3s.

ChC—Chelsea loamy fine sand, 4 to 10 percent slopes. This gently sloping and moderately sloping, excessively drained soil is on short, irregular slopes on hummocky, sandy outwash plains. Areas are mostly long and narrow in shape and range from 2 to 80 acres in size.

In a typical profile the surface layer is brown loamy fine sand about 10 inches thick. The subsurface layer is dark yellowish brown and yellowish brown fine sand about 32 inches thick. The subsoil, to a depth of about 80 inches, is light yellowish brown, loose fine sand that contains bands of friable loamy fine sand. In some areas the soil does not have bands within a depth of 60 inches. A few areas have a gravelly sand substratum below a depth of 40 inches.

Included with this soil in mapping are a few areas of somewhat poorly drained Ayrshire soils and poorly drained Vincennes soils in lower positions in the landscape. These inclusions make up about 3 to 5 percent of the unit.

This Chelsea soil has a low available water capacity and rapid permeability. The organic matter content is low, and surface runoff is medium. The surface layer is very friable and easily tilled over a wide range in moisture content.

Most areas are in cultivated crops. Some areas are used for hay or pasture, orchards, or irrigated vegetable crops.

This soil is suited to corn, soybeans, grain sorghum, small grain, and hay and pasture. The low available water capacity is a limitation. During years of below average or poorly distributed rainfall, crops are subject to severe damage from drought. Conservation tillage that leaves all or part of the crop residue on the surface and planting early in spring help to overcome the potential damage from drought. Conservation practices are needed to control erosion when cultivated crops are grown. Soil loss can be reduced by crop rotation, diversions, contour farming, grassed waterways, and grade stabilization structures. The use of cover crops and leaving all or part of the crop residues on the surface help to control soil blowing and erosion and maintain and improve the organic matter content of this soil.

The use of this soil for grasses and legumes for hay or pasture is also effective in controlling soil blowing and erosion. Proper stocking rates and pasture rotation will help keep the pasture and the soil in good condition.

This soil is suited to trees but is moderately limited by a hazard of seedling mortality. Planting tree seedlings early in spring helps them become better established before the dry season of the year. Replanting some seedlings is often necessary.

This soil has a slight limitation for building sites and local roads and streets and a severe limitation for septic tank absorption fields. Seepage of effluent into underground water supplies may become a problem.

This soil is in capability subclass IVs and woodland suitability subclass 3s.

ClF—Chetwynd loam, 25 to 50 percent slopes. This steep and very steep, well drained soil is on side slopes and breaks adjacent to drainageways. Areas are long and narrow in shape and range from 10 to 80 acres in size. Slopes are short.

In a typical profile the surface layer is dark grayish brown loam about 3 inches thick. The subsurface layer is brown loam about 3 inches thick. The firm subsoil, to a depth of 80 inches, is brown sandy clay loam in the upper part, yellowish red clay loam and yellowish red sandy clay loam in the lower part. Below this is dark brown and yellowish red sandy loam with bands of sand. In some areas of pasture the surface layer is brown loam about 3 to 6 inches thick. In some areas the subsoil is silty clay loam. These areas are moderately sloping and are on long narrow ridgetops.

Included with this soil in mapping are a few areas of somewhat poorly drained Wakeland soils and poorly drained Birds soils adjacent to small streams. These inclusions make up about 4 to 6 percent of the unit.

This Chetwynd soil has a high available water capacity and moderate permeability. The organic matter content of the surface layer is high in wooded areas and moderate in pasture areas. Surface runoff is very rapid.

Most areas are in woodland. A few areas are used for grasses and legumes for forage or pasture.

This soil is not suited to corn and soybeans because of the slope and very severe hazard of erosion. Small grain is occasionally grown so that stands of grasses and legumes can be reestablished.

This soil is poorly suited to grasses and legumes for forage or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and excessive runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricting use during wet periods will help keep this soil in good condition.

This soil is well suited to trees. Many areas are in woodland, but the limitation to the use of equipment is severe. The hazard of erosion is severe. Logging roads can often be located on ridgetops. Removal of vegetation should be kept to a minimum and exposed areas revegetated as soon as possible. This soil is moderately limited by plant competition, but seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

The steep and very steep slopes severely limit building sites, local roads and streets, and septic tank absorption fields. This soil is generally unsuited to these uses. Removal of vegetation should be kept to a minimum, and temporary plant cover should be established as quickly as possible on disturbed areas so that soil loss can be held to a minimum.

This soil is in capability subclass VIe and woodland suitability subclass 1r.

CoA—Conotton sandy loam, 0 to 3 percent slopes. This nearly level and gently sloping, well drained soil is on broad outwash plains. Areas are irregular in shape and range from 10 to 400 acres in size.

In a typical profile the surface layer is dark brown sandy loam about 10 inches thick. The subsoil is about 42 inches thick. The upper part of the subsoil is dark brown, friable sandy loam; the middle part is dark brown and reddish brown, firm very gravelly and gravelly sandy clay loam; and the lower part is dark brown, firm gravelly sandy loam. The substratum, to a depth of 60 inches, is brown very gravelly sand. Some small areas have a loamy sand surface layer.

Included with this soil in mapping are small areas of somewhat poorly drained Ayrshire soils in lower, slightly depressed areas. These inclusions make up about 4 to 6 percent of the unit.

This Conotton soil has a low available water capacity and rapid permeability. The organic matter content is moderate. Surface runoff is slow. The surface layer is very friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for hay or pasture, and some are used for melons or irrigated vegetable crops. A few areas are in orchards.

This soil is suited to corn, soybeans, grain sorghum, small grain, and hay or pasture. The low available water capacity is a limitation. During years of below average or poorly distributed rainfall, crops are subject to severe damage from drought. Conservation tillage that leaves all or part of the crop residue on the surface and planting early in spring help to overcome the potential damage to crops from drought. Sprinklers are used to irrigate many areas, and crop yields have increased appreciably. The use of cover crops helps to control soil blowing and maintain and improve the organic matter content of this soil.

The use of this soil for grasses and legumes for hay or pasture is also effective in controlling soil blowing. Proper stocking rates and pasture rotation will help keep the pasture and soil in good condition.

This soil is suited to trees but is moderately limited by a hazard of seedling mortality. Planting should be done early in spring to help reduce damage from drought. Replanting some seedlings may be necessary.

Frost action is a slight limitation for building sites and a moderate limitation for local roads and streets. This soil also has a severe limitation for septic tank absorption fields. Although sewage effluent is readily absorbed into the soil, pollution of ground water supplies may become a problem.

This soil is in capability subclass IIIs and woodland suitability subclass 3s.

Du—Dumps, mine. This unit consists of mixtures of uneven accumulations, or piles, of carbonaceous shale, low grade coal, and waste rock and shale piled near mine shafts and at loading points where coal was cleaned and sorted. Areas range from 10 to more than 150 acres in size (fig. 7).

Included in mapping are small areas of poorly drained Birds soils and somewhat poorly drained Wakeland soils covered by mine waste materials deposited by surface runoff.

This material is acid, very erosive, and incapable of supporting vegetation without major reclamation.

Ed—Edwards Variant muck, drained. This nearly level, very poorly drained soil is in depressions on nearly level outwash terraces. It is frequently ponded by surface water runoff from adjacent higher areas. Areas are about 80 to 120 acres in size.

In a typical profile the surface layer is black muck about 13 inches thick. The subsurface layer to a depth of 20 inches is dark brown, friable muck. The next 8 inches is gray, friable marl that is 5 to 10 percent gravel. The substratum, to a depth of 60 inches, is mottled, grayish brown and gray gravelly sand. In some areas the muck below a depth of 20 inches is mottled and contains many white shells. In other areas the thickness

Figure 7.—Areas of Dumps, mine, are ready for reclamation.

of the muck exceeds 40 inches and contains few or common woody fragments.

Included in mapping around the edges of this unit are small areas of very poorly drained Lyles soils and poorly drained Selma soils. Also included are small areas that are more than 50 percent mineral material. These inclusions make up 4 to 8 percent of the unit.

This Edwards Variant soil has a high available water capacity and moderately slow permeability. The organic matter content is very high. Surface runoff is very slow. This soil has a seasonal high water table at or above the surface during winter and early in spring. The surface layer is friable and easily tilled over a wide range in moisture content.

Most areas are drained and used for cultivated crops.

This soil is well suited to vegetable crops, corn, soybeans, and small grain. Wetness is the main limitation. Excess water can be removed by open ditches, subsurface drains, pumping, or a combination of these practices. The use of cover crops and windbreaks help protect this soil from soil blowing.

This soil is well suited to grasses and legumes for hay or pasture, but drainage is necessary to obtain high yields. Overgrazing or grazing when the soils are too wet reduces plant density and plant hardiness. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help maintain good plant densities.

This soil is not suited to commercial timber production, and the limitation to the use of equipment is severe. The hazards of plant competition, seedling mortality, and windthrow are severe limitations.

This soil is severely limited for building sites by ponding, low strength, and a prolonged seasonal high water table at or near the surface. It is severely limited for local roads and streets by the seasonal high water table, high potential for frost action, and low strength. Ponding is a severe limitation for septic tank absorption fields. This soil is generally unsuited to these purposes. Alternate sites should be considered for any type of nonfarm use.

This soil is in capability subclass IVw and woodland suitability subclass 3w.

EkA—Elkinsville silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on terraces. Areas are irregular in shape and range from 10 to 50 acres in size.

In a typical profile the surface layer is dark brown silt loam about 8 inches thick, and the subsurface layer is brown silt loam about 7 inches thick. The subsoil is about 39 inches thick. The upper part of the subsoil is brown and strong brown, firm silty clay loam, and the lower part is strong brown, firm sandy clay loam. The underlying material, to a depth of 60 inches, is yellowish brown loam with layers of fine sandy loam. In some areas the lower B2 horizon contains more clay, and a few areas are underlain by stratified clay loam and silty clay below a depth of 50 inches. The underlying material is mottled in some areas.

Included in mapping are small areas of poorly drained Vincennes soils and somewhat poorly drained Ayrshire soils in lower positions in the landscape. Also included are small areas of poorly drained Peoga Variant soils. These inclusions make up 5 to 10 percent of the unit.

This Elkinsville soil has a high available water capacity and moderate permeability. The organic matter content is moderate. Surface runoff is slow. The surface layer is friable and easily tilled over a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for hay or pasture, and a few are in orchards and woodland.

This soil is well suited to corn, soybeans, and small grain. The use of conservation tillage that leaves all or part of the crop residues on the surface and cover crops help to maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. Plant competition is a moderate limitation but seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

Shrink-swell potential is a moderate limitation for building sites. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material will help prevent structural damage caused by shrinking and swelling and low strength of the soil. This soil is severely limited for local roads and streets by a high potential for frost action and low strength. The base material must be strengthened or replaced if roads are to support vehicular traffic. There is a slight limitation for septic tank absorption fields.

This soil is in capability class I and woodland suitability subclass 1o.

ElA—Elston sandy loam, 0 to 3 percent slopes. This nearly level and gently sloping, well drained soil is on broad sandy outwash plains. Areas are generally large and range from 80 to 200 acres.

In a typical profile the surface layer is very dark brown sandy loam about 10 inches thick. The subsurface layer is very dark brown sandy loam about 9 inches thick. The subsoil is about 47 inches thick. The upper part of the subsoil is dark yellowish brown, friable sandy loam; the middle part is dark brown, friable loamy sand; and the lower part is dark brown, loose, coarse sand. The substratum, to a depth of about 80 inches, is pale brown fine sand and sand. There are small areas that have a loam surface layer.

Included with this soil in mapping are small areas of very poorly drained Lyles soils and poorly drained Selma soils in lower, slightly depressed areas in the landscape. These inclusions make up 7 to 12 percent of the unit.

This Elston soil has a low available water capacity and moderately rapid permeability. The organic matter content is high, and surface runoff is slow. The surface layer is friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for hay or pasture, and some are used for melons or irrigated vegetable crops.

This soil is suited to corn, soybeans, grain sorghum, small grain, and hay or pasture. The low available water capacity is a limitation. During years of below average or poorly distributed rainfall, crops are subject to severe damage from drought. Use of conservation tillage that leaves all or part of the crop residue on the surface and planting early in spring help to overcome the potential damage from drought. Sprinklers are used to irrigate many areas, and crop yields have increased appreciably. The use of cover crops helps to control soil blowing and maintain and improve the organic matter content of this soil.

This soil has a slight limitation for building sites, local roads and streets, and septic tank absorption fields.

This soil is in capability subclass IIIs. It is not assigned to a woodland suitability subclass.

FaB—Fairpoint shaly silt loam, 0 to 8 percent slopes. This nearly level to moderately sloping, well drained soil is on uplands. It formed in mine spoil that was shaped and smoothed after surface mining operations. Mine spoil consists mainly of masses of soft shale fragments, moderately fine and medium textured soil, glacial till, and sandstone fragments. The spoil is mostly neutral, but some spots are extremely acid and some areas are mildly alkaline. Most sandstone fragments larger than 4 to 6 inches across have been buried during shaping and smoothing operations. Areas range from 60 to 250 acres in size.

In a typical profile the surface layer is brown shaly silt loam about 1 inch thick. The substratum, to a depth of 60 inches, is yellowish brown, shaly silt loam, shaly silty clay loam, and very shaly silty clay loam that is 30 to 40 percent gray shale fragments and 5 to 15 percent sandstone fragments. In some areas the substratum below a depth of 30 inches is mostly sandstone and shale fragments.

Included in mapping are some areas where a minimum of land shaping was done after mining: only the peaks were smoothed, leaving elongated pits that mostly contain water. The sides of many of these pits are very steep, and large sandstone fragments are exposed at the surface. Also included are abandoned mine haul roads that mostly consist of extremely acid carbonaceous shale and other coal mining refuse. These inclusions make up 10 to 15 percent of the unit.

This Fairpoint soil has a moderate available water capacity and moderately slow permeability. Organic matter content of the surface layer is low, and surface runoff is medium to rapid. The surface layer is friable, but tillage operations are restricted in most areas by the sandstone fragments.

Most areas are used for pasture (fig. 8). A few are used for small grain or hay.

This soil is poorly suited to corn, soybeans, or small grain. Tillage operations are hindered in some areas where the sandstone fragments are near the surface. Erosion is a hazard on slopes greater than 2 percent. Mulch tillage, conservation tillage that leaves all of the crop residue on the surface, and crop rotations will reduce runoff and erosion and help improve the organic matter content and tilth of the soil.

This soil is fairly well suited to grasses and legumes for hay or pasture. Tillage and harvesting operations are limited in some areas where the sandstone fragments are near the surface. A wide variety of grasses and legumes, including alfalfa, are suited. The use of this soil for hay and pasture is an effective way to prevent erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees. It is moderately limited by plant competition, but seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

This soil has moderate limitations for building sites. Large sandstone fragments are a problem in some places. Foundations and footings should be designed to compensate for shrinking and swelling of the soil. Low soil strength and frost action are moderate limitations for roads and streets. The soil will need to be strengthened with more suitable material if roads are to support vehicular traffic. This soil settles at different rates, depending on the amount of compaction and kind of material. Foundations and roads should be designed to compensate for these differences in settling rates. The moderately slow permeability is a severe limitation for septic tanks. Absorption fields should be enlarged and distribution lines should be installed across the slope.

This soil is in capability subclass IIIe and woodland suitability subclass 1r.

FbG—Fairpoint very shaly silt loam, 35 to 90 percent slopes. This very steep, well drained soil is on the uplands. It consists of narrow, elongated mounds of spoil from surface mining operations. This spoil is a mixture of shale, soil, glacial till, and sandstone fragments. It is mostly neutral, but some areas are extremely acid and other areas are mildly alkaline.

In a typical pedon the surface layer is very dark grayish brown, very shaly silt loam about 2 inches thick. The underlying material, to a depth of 60 inches, is yellowish brown silty clay loam intermixed with layers of gray shale and sandstone fragments.

Included in mapping are narrow elongated pits that contain water. Some of these pits are filled with carbonaceous shale and low grade coal waste material from coal preparation and loading docks. Also included are abandoned roadbeds, which consist mainly of carbonaceous shale and low grade coal. These areas are extremely acid and support little if any vegetation. In places, there are many large sandstone fragments on the surface. These inclusions make up 8 to 12 percent of the unit.

This Fairpoint soil has a moderate available water capacity and moderately slow permeability. Organic matter content of the surface layer is low, and surface runoff is very rapid. The surface layer is friable, but tillage operations are restricted by the slope and the sandstone fragments.

Most areas are used for woodland. Some areas have cottages and are used for recreation.

This soil is generally unsuited to grasses and legumes for hay or pasture. The steep slopes and sandstone fragments hinder the use of tillage and harvesting machinery. Pastures are generally not improved unless the spoil has been partially smoothed so that farm equipment can be used.

This soil is best suited to trees, and most areas are used for woodland. The trees are mostly pine, locust, cottonwood, and sycamore. The very steep slopes hinder the use of planting and logging equipment. Onsite evaluation is needed to determine tree species to plant and the management practices needed.

This soil is generally unsuited to building sites because of the severe limitations of the steep slopes and soil slippage. These limitations are also severe for local roads and streets. Cuts and fills are needed, and roads should be built on the contour where possible. Road subgrades will need to be strengthened to compensate for low soil strength and frost action. The moderately slow permeability and slopes are severe limitations for septic tank absorption fields, and this soil is generally unsuited to this use.

This soil is in capability subclass VIIe and woodland suitability subclass 1r.

Ha—Haymond silt loam, frequently flooded. This nearly level, well drained soil is on broad bottom lands. It is frequently flooded for brief periods of time. Areas are irregular in shape and range from 20 to 150 acres in size.

In a typical profile the surface layer is brown silt loam about 10 inches thick. The subsoil is dark yellowish brown and yellowish brown, friable silt loam about 34 inches thick. The substratum, to a depth of 60 inches, is yellowish brown fine sandy loam with layers of silt loam.

Included with this soil in mapping are small areas of poorly drained Petrolia soils in sloughs and small areas of soils that have a loamy sand surface layer adjacent to

Figure 8.—Pasture on Fairpoint shaly silt loam, 0 to 8 percent slopes.

streams. These inclusions make up 4 to 7 percent of the unit.

This soil has a very high available water capacity and moderate permeability. The organic matter content of the surface layer is moderate. Surface runoff is slow. The surface layer is friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some are used for pasture or woodlands.

This soil is suited to corn and soybeans because they can be planted and harvested during the period of least flooding. Flooding is a hazard in the use and management of this soil. Alfalfa and small grains frequently drown out in winter and early spring. With proper management this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. Alfalfa is subject to severe damage from flooding. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the soil in good condition.

This soil is suited to trees, and some areas are in hardwoods. This soil is moderately limited by plant competition, but seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil is generally unsuited to building sites and septic tank absorption fields because it is subject to frequent flooding, a severe limitation. The high potential for frost action and flooding is a severe limitation for local roads and streets. Constructing roads on raised, well-compacted fill material and providing adequate side ditches and culverts will reduce flood and frost damage.

This soil is in capability subclass IIIw and woodland suitability subclass 1o.

Hb—Haymond silt loam, rarely flooded. This nearly level, well drained soil is on broad bottom lands. It is protected by levees and is rarely flooded. Seepage through the levees causes partial flooding in the lower areas during extended periods of high water. Areas of this unit are irregular in shape and range from 20 to 200 acres in size.

In a typical profile the surface layer is brown silt loam about 10 inches thick. The subsoil is dark yellowish brown and yellowish brown, friable silt loam about 34 inches thick. The substratum, to a depth of 60 inches, is yellowish brown fine sandy loam with layers of silt loam.

Included with this soil in mapping are small, narrow, elongated areas of Petrolia soils in sloughs. A few areas of Haymond Variant soils are adjacent to sloughs. These inclusions make up 7 to 10 percent of the unit.

This soil has a very high available water capacity and moderate permeability. The organic matter content of the surface layer is moderate. Surface runoff is slow. The surface layer is friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some are used for small grain, pasture, or woodlands.

This soil is suited to corn, soybeans, and small grain. Flooding is a hazard in the use and management of this soil. The soil areas are protected by levees, but seepage through the levees during periods of high water causes flooding in some of the lower areas. Alfalfa and small grains occasionally drown out in winter and early in spring in the lower areas. With flood protection and proper management, this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the soil in good condition.

This soil is suited to trees, and some areas are in hardwoods. This soil is moderately limited by plant competition, but seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil has a severe limitation for building sites and a slight limitation for septic tank absorption fields. It is generally unsuited to building sites because of flooding. The high potential for frost action is a severe limitation for local roads and streets. Constructing roads on raised, well-compacted fill material and providing adequate side ditches and culverts will reduce flood and frost damage.

This soil is in capability class I and woodland suitability subclass 1o.

Hc—Haymond Variant loamy sand, frequently flooded. This nearly level, well drained soil is on bottom lands adjacent to streams. It is frequently flooded for brief periods of time. Areas are long and narrow in shape and range from 20 to 160 acres in size. Most areas are in woodland adjacent to rivers. Some areas are dissected by small channels parallel to the larger stream channels.

In a typical profile the surface layer is brown and dark yellowish brown loamy sand about 15 inches thick. The subsoil is dark yellowish brown, friable silt loam about 29 inches thick. The substratum, to a depth of 60 inches, is yellowish brown fine sandy loam with layers of loamy sand. A few small areas have a loamy sand surface layer about 30 inches thick. A few small areas have a silt loam surface layer.

Included with this soil in mapping are small areas of poorly drained Petrolia and Zipp soils in lower areas in sloughs and small drainage channels. These inclusions make up about 10 percent of the unit.

This soil has a high available water capacity and moderate permeability. The organic matter content of the surface layer is moderate. Surface runoff is slow. This soil is subject to flooding during winter and early spring in areas not protected by levees. The surface layer is friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for pasture. Areas not protected by levees are mostly in woodland.

This soil is suited to corn and soybeans because they can be planted and harvested during the period of least flooding. Flooding is a hazard in the use and management of this soil. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. Alfalfa is subject to severe damage from flooding. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help to keep the soil in good condition.

This soil is suited to trees, and many areas are in hardwoods. This soil is moderately limited by plant competition, but seedlings survive and grow well when competing vegetation is controlled by spraying, cutting, or girdling.

This soil is generally unsuited to building sites and septic tank absorption fields because it is subject to frequent flooding, a severe limitation. Flooding and a high potential for frost action are severe limitations for local roads and streets. Constructing roads on raised, well compacted fill material and providing adequate side ditches and culverts will reduce flood and frost damage.

This soil is in capability unit subclass IIIw and woodland suitability subclass 1o.

HeA—Henshaw silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on low stream terraces. Areas are irregular in shape and range from 5 to 20 acres in size.

In a typical profile the surface layer is brown silt loam about 10 inches thick. The subsoil is mottled, yellowish brown, firm silty clay loam about 39 inches thick. The substratum, to a depth of 60 inches, is mottled, yellowish brown and gray silty clay loam with layers of silt loam. In some pedons associated with Elkinsville and Peoga soils, the underlying material is medium acid. In some small areas the material is finer textured.

Included with this soil in mapping are small areas of poorly drained Evansville soils in lower parts of the landscape. These inclusions make up 6 to 10 percent of the unit.

This Henshaw soil has a high available water capacity and moderately slow permeability. The organic matter content of the surface layer is moderate. Surface runoff is slow. This soil has a seasonal high water table at a depth of 1 to 2 feet during winter and early in spring. The surface layer is friable and easily tilled over a wide range in moisture content.

Nearly all areas are used for cultivated crops. A few areas are in grass or legumes and used for hay or pasture. Very few areas are in woodland.

This soil is well suited to corn, soybeans, small grain, and hay and pasture. Wetness is the major limitation in use and management. With adequate drainage, a conservation cropping system can be used that includes row crops most of the time. Random tile in lower areas that collect excess water runoff help control wetness. The use of conservation tillage that leaves all or part of the crop residue on the surface and cover crops help to maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is suited to trees but is seldom used for that purpose. The limitation for equipment is moderate. This soil is moderately limited by plant competition and severely limited by the hazard of windthrow. Harvesting and planting operations are delayed until drier periods of the year. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Species that can tolerate wet conditions are the most suitable.

The seasonal high water table is a severe limitation for building sites. Dwellings should be constructed without basements, and foundations and footings should be strengthened and foundation drain tile used to prevent structural damage caused by shrinking and swelling of the soil. Backfilling with a coarser material will also help overcome this problem. The low strength and seasonal high water table are severe limitations for local roads and streets. The base material for roads will need strengthening or replacing by more suitable material to support vehicular traffic. Surface and subsurface drainage will lower the water table and help prevent damage caused by frost action. The seasonal high water table and moderately slow permeability are severe limitations for septic tank absorption fields. Where community sewer systems are not available, the water table can be lowered by tile systems and septic tank absorption fields enlarged to reduce the effect of the moderately slow permeability.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

HkF—Hickory loam, 25 to 50 percent slopes. This steep and very steep soil is on side slopes and breaks adjacent to drainageways. Slopes are short. Areas are long and narrow in shape and range from 20 to 100 acres in size.

In a typical profile the surface layer is dark grayish brown loam about 3 inches thick. The subsurface layer is brown loam about 2 inches thick. The subsoil is about 44 inches thick. The upper part is yellowish brown, friable loam, and the lower part is brown and yellowish brown, firm clay loam. The substratum, to a depth of about 80 inches, is brown clay loam. In a few areas some of the steeply sloping soils have a brown silt loam or loam surface layer 3 to 6 inches thick. Some small areas are underlain by weathered shale and sandstone below a depth of 40 inches. In a few moderately sloping areas the soils have a silty clay loam subsoil and a silt loam substratum.

Included with this soil in mapping are a few areas of nearly level, somewhat poorly drained Wakeland soils adjacent to small streams. These inclusions make up about 5 to 7 percent of the unit.

This Hickory soil has a high available water capacity and moderate permeability. The organic matter content of the surface layer is moderate. Surface runoff is very rapid.

Most areas are in woodland (fig. 9). A few areas are used for growing grasses and legumes for forage or pasture.

This soil is not suited to cultivated crops because of the slope and very severe hazard of erosion. Small grain is occasionally grown as a nurse crop so that stands of grasses and legumes can be reestablished.

This soil is poorly suited to grasses and legumes for forage or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and excessive runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep this soil in good condition.

This soil is well suited to trees, and many areas are in woodland. The limitation to the use of equipment is severe. This soil is severely limited by the hazard of erosion and moderately limited by plant competition. Logging roads can often be located on ridgetops. Removal of vegetation should be kept to a minimum and exposed areas revegetated as soon as possible. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

The steep and very steep slopes are severe limitations for building sites, local roads and streets, and septic tank absorption fields. This soil is generally unsuited to these uses. Removal of vegetation should be held to a minimum and temporary plant cover should be established as quickly as possible on disturbed areas so that soil loss can be held to a minimum.

This soil is in capability subclass VIe and woodland suitability subclass 1r.

Figure 9.—Typical stand of hardwoods on Hickory loam, 25 to 50 percent slopes.

HoA—Hosmer silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on broad ridgetops of the uplands. Areas are long and usually narrow in shape. They range from 2 to 60 acres in size.

In a typical profile the surface layer is brown silt loam about 11 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 47 inches thick. The upper part is yellowish brown, friable or firm silt loam and silty clay loam, and the lower part is a yellowish brown, very firm silt loam fragipan. The substratum, to a depth of about 80 inches, is yellowish brown silt loam. A few areas are mottled below a depth of 20 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Iva soils at the heads of small drainageways. Also included are small intermingled areas of well drained Iona soils. These inclusions make up about 4 to 7 percent of the unit.

This Hosmer soil has a moderate available water capacity and very slow permeability. The organic matter content is moderate, and surface runoff is slow. This soil has a perched water table at a depth of 3 to 6 feet during winter and early spring. The surface layer is friable and easily tilled over a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for hay and pasture, and a few areas are used for orchards or woodlands.

This soil is well suited to corn, soybeans, and small grain. The very slowly permeable fragipan and moderate available water capacity are limitations. Wetness in early spring caused by perching of the water table above the fragipan commonly delays farming operations. During years when rainfall is below average or poorly distributed, crops are subject to damage from drought. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface and the use of cover crops help maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to most grasses and legumes for hay or pasture. It is not well suited to alfalfa and other deep-rooted crops because the fragipan restricts the downward movement of roots. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates and pasture rotation are essential to keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. Plant competition is a moderate limitation. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil has a slight limitation for building sites. Wetness is a moderate limitation for dwellings with basements. Foundations, footings, and basement walls should be strengthened and foundation drain tile installed to prevent structural damage caused by wetness. The low strength and frost action are severe limitations for local roads and streets. The base material must be strengthened to support vehicular traffic. Absorption fields should be enlarged to compensate for the very slow permeability, which is a severe limitation.

This soil is in capability subclass IIs and woodland suitability subclass 2o.

HoB2—Hosmer silt loam, 2 to 6 percent slopes, eroded. This gently sloping, well drained soil is on broad convex ridgetops and long side slopes of the uplands. Areas are usually large and irregular in shape. They range from 30 to 100 acres in size.

In a typical profile the surface layer is brown silt loam about 6 inches thick. The subsoil is about 58 inches thick. The upper part of the subsoil is yellowish brown, friable or firm silt loam or silty clay loam, and the lower part is a yellowish brown, very firm silt loam fragipan. The substratum, to a depth of about 80 inches, is yellowish brown silt loam. In some areas the subsoil is mottled below a depth of 20 inches. A few areas on small knolls and adjacent to drainageways have a yellowish brown surface layer. Some areas are on nearly level ridgetops.

Included with this soil in mapping are small areas of somewhat poorly drained Iva soils at the heads of drainageways. Also included are small areas of well drained Alford and Iona soils on the same side slopes. These inclusions make up about 4 to 6 percent of the unit.

This Hosmer soil has a moderate available water capacity and very slow permeability. The organic matter content is moderate, and surface runoff is medium. This soil has a perched water table at a depth of 3 to 6 feet during winter and early spring. The surface layer is friable and easily tilled over a fairly wide range in moisture content.

Most areas are used for cultivated crops. Many areas are used for hay and pasture, and a few areas are used for orchards or woodland.

This soil is suited to corn, soybeans, and small grain. The very slowly permeable fragipan and moderate available water capacity are limitations. During years when rainfall is below average or poorly distributed, crops are subject to damage from drought. When cultivated, conservation practices are needed to control erosion and surface runoff. Soil loss can be reduced by practices such as crop rotations, conservation tillage that leaves all or part of the crop residue on the surface, terraces, contour farming, grassed waterways (fig. 10), or grade stabilization structures. Leaving all or part of the crop residue on the surface and cover crops also help to control erosion and maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to most grasses and legumes for hay or pasture. It is not suited to alfalfa and other deep-rooted crops because the fragipan restricts the downward movement of roots. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates

Figure 10.—Grassed waterway on Hosmer silt loam, 2 to 6 percent slopes, eroded.

and pasture rotations are essential to keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. It is moderately limited by plant competition, but seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil has slight limitations for building sites. Wetness is a moderate limitation for dwellings with basements. Foundations, footings, and basement walls should be strengthened and foundation drain tile used to prevent structural damage caused by wetness. The low strength and frost action are severe limitations for local roads and streets. The base material for road subgrade must be strengthened to support vehicular traffic. Septic tank absorption fields must be enlarged to compensate for the very slow permeability, which is a severe limitation.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

HoC3—Hosmer silt loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, well drained soil is on long side slopes below ridgetops and on side slopes adjacent to drainageways of the uplands. Areas are usually long and irregular in shape and range from 2 to 60 acres in size.

In a typical profile the surface layer is yellowish brown silt loam about 6 inches thick. The yellowish brown subsoil is about 51 inches thick. The upper part of the subsoil is firm silty clay loam, and the lower part is a very firm silt loam fragipan. The substratum, to a depth of 60 inches, is yellowish brown silt loam. In some areas the fragipan is exposed at the surface.

Included with this soil in mapping are small areas of well drained Iona soils and Sylvan soils on toe slopes. Also included are small areas of somewhat poorly drained Wakeland soils adjacent to small drainageways. These inclusions make up about 6 to 8 percent of the unit.

This Hosmer soil has a moderate available water capacity and very slow permeability. The organic matter content is low because of erosion of the surface layer. Surface runoff is rapid. This soil has a perched water table at a depth of 3 to 6 feet in spring. Restricting tillage to a rather narrow range in moisture content will reduce the tendency for soil compaction and clodding. Seedbeds are often low in moisture content resulting in poor seed germination.

Most areas are used for cultivated crops. Some areas are used for hay and pasture, and a few areas are used for orchards or woodland.

This soil is not well suited to corn, soybeans, and small grain because of the severe hazard of erosion. The very slowly permeable fragipan and moderate available water capacity are limitations. During years when rainfall is below average or poorly distributed, crops are subject to severe damage from drought. Use of conservation tillage that leaves all or part of the crop residue on the surface and planting early in spring help to overcome the potential damage from drought. When cultivated crops are grown, conservation practices are needed to control erosion and surface water runoff. Soil loss can be reduced by practices such as crop rotation, conservation tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures. Leaving all or part of the crop residue on the surface and cover crops also help to control erosion and maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to most grasses and legumes for hay or pasture. It is not well suited to alfalfa and other deep-rooted crops because the fragipan restricts the downward movement of roots. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotations are essential to keep the pasture and soil in good condition.

This soil is well suited to hardwood trees. It is moderately limited by plant competition, but seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

Slope and wetness are moderate limitations for building sites. Buildings should be designed to complement slopes, or grading must be done to modify slopes. Foundations, footings, and basement walls should be strengthened, and foundation drain tile installed to prevent structural damage caused by wetness. Removal of vegetation should be kept to a minimum, and exposed areas reseeded or sodded as soon as possible. The low strength and frost action are severe limitations for local roads and streets. The base material for road subgrades must be strengthened to support vehicular traffic. Septic tank absorption fields must be enlarged to compensate for the very slow permeability, which is a severe limitation. Land shaping and installing the distribution lines across the slope are generally necessary for proper functioning of the absorption field.

This soil is in capability subclass IVe and woodland suitability subclass 2o.

HoD3—Hosmer silt loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, well drained soil is on side slopes of natural draws and side slopes below ridgetops of the uplands. Areas are usually elongated and irregular in shape and range from 2 to 60 acres in size.

In a typical profile the surface layer is brown silt loam about 6 inches thick. The yellowish brown subsoil is about 41 inches thick. The upper part of the subsoil is firm silty clay loam, and the lower part is a very firm silt loam fragipan. The substratum, to a depth of 60 inches, is yellowish brown silt loam. In a few areas the depth to the fragipan is 3 to 10 inches. In some small areas the lower part of the fragipan and substratum is weathered sandstone and shale.

Included with this soil in mapping are small areas of well drained Alford soils at the crest of side slopes. Also included are small areas of well drained Hickory soils on drainageway side slopes. A few areas have gullies that are 1 to 3 feet deep. These inclusions make up 10 to 12 percent of the unit.

This Hosmer soil has a moderate available water capacity and very slow permeability. The organic matter content is low because of erosion of the surface layer. Surface runoff is very rapid. This soil has a perched water table at a depth of 3 to 6 feet in the spring. The surface layer is firm. Restricting tillage to a rather narrow range in moisture content reduces the tendency for soil compaction and clodding.

Most of this soil is used for hay and pasture or woodland, and some areas are used for cultivated crops and orchards.

This soil is generally unsuitable for cultivated crops because of the very severe hazard of erosion. Small grain is occasionally grown so that stands of grass and legumes can be reestablished.

This soil is suited to most grasses and legumes for hay or pasture. It is not well suited to alfalfa and other deep-rooted crops because the fragipan restricts the downward movement of roots. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotations are essential to keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. The limitation to the use of equipment is moderate. Plant competition and the hazard of erosion are moderate limitations, but seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Removal of vegetation should be kept to a minimum, and exposed areas revegetated as soon as possible to prevent further erosion.

Slope is a severe limitation for building sites. Slopes must be graded, and buildings should be designed to complement slopes. Foundations, footings, and basement walls should be strengthened and foundation drain tile installed to prevent structural damage caused by wetness. Removal of vegetation should be kept to a minimum, and exposed areas revegetated as soon as possible. This soil has a severe limitation for local roads and streets. There is a need for cuts and fills, and roads should be built on the contour where possible. The base material for roads must be strengthened to support vehicular traffic. The very slowly permeable fragipan is a severe limitation for septic tank absorption fields. Land shaping and installing the distribution lines across the slope are generally necessary for proper functioning of absorption fields.

This soil is in capability subclass VIe and woodland suitability subclass 2r.

IoA—Iona silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on broad ridgetops of the uplands. Areas are usually broad and irregular in shape and range from 2 to 40 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 35 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam; the middle is yellowish brown, mottled, firm silty clay loam; and the lower part is light yellowish brown, mottled, friable silt loam. The substratum, to a depth of 60 inches, is light yellowish brown, mottled silt loam. In a few areas the substratum is slightly acid at a depth of 50 to 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Reesville soils at the heads of small drainageways. These inclusions make up about 8 percent of the unit.

This Iona soil has a high available water capacity and moderately slow permeability. The organic matter content is moderate. Surface runoff from cultivated areas is slow. This soil has a seasonal high water table at a depth of 2 to 4 feet during winter and early in spring. The surface layer is friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in orchards or woodland.

This soil is well suited to corn, soybeans, and small grain. Conservation tillage that leaves all or part of the crop residue on the surface and cover crops help to maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. It is moderately limited by plant competition, but seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

Wetness and shrinking and swelling of the soil are moderate limitations for buildings without basements and wetness is a severe limitation for buildings with basements. Dwellings should be constructed without basements. Foundations and footings should be strengthened to prevent structural damage caused by shrinking and swelling of the soil. Backfilling with sand and gravel is often used. The severe limitation for local roads and streets can be overcome by providing ditches along roadsides to lower the water table and help prevent damage caused by frost action. The base material for roads will need strengthening or replacing by more suitable material to support vehicular traffic. The moderately slow permeability and wetness are severe limitations for septic tank absorption fields. Where sewer facilities are not available and the water table has been lowered by subsurface drainage systems, larger absorption fields have been used to overcome the moderately slow permeability.

This soil is in capability class I and woodland suitability subclass 1o.

IvA—Iva silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad flats of the uplands. Areas are broad and irregular in shape. They range from 4 to 60 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown silt loam about 4 inches thick. The subsoil is grayish brown and yellowish brown, mottled, firm silty clay loam and friable silt loam about 42 inches thick. The substratum, to a depth of 60 inches, is mottled, yellowish brown and light brownish gray silt loam. This soil is grayer in small areas at the heads of drainageways and in slightly depressed areas on broad flats.

Included with this soil in mapping are small areas of well drained Hosmer soils adjacent to drainageways. Some of these areas are severely eroded and have slopes greater than 2 percent. A few narrow areas of somewhat poorly drained Wakeland soils adjacent to drainageways are also included. These inclusions make up about 8 percent of the unit.

This Iva soil has a high available water capacity and slow permeability. The organic matter content is moderate. Surface runoff is slow. This soil has a seasonal high water table at a depth of 1 to 3 feet during winter and early spring. The surface layer is friable and easily tilled over a wide range in moisture content.

Nearly all areas of this soil are used for cultivated crops. Some areas are in grass or legumes and used for hay or pasture. Few areas are in woodland.

This soil is well suited to corn, soybeans, small grain, and hay and pasture. Wetness is the major limitation in use and management. With adequate drainage, a conservation cropping system that includes row crops most of the time can be used. Random tile in lower areas that collect excess water runoff help control wetness. The use of conservation tillage that leaves all or part of the crop residue on the surface and cover crops help to maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. The limitation for the use of equipment is moderate and harvesting and planting operations should be done in drier periods. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil has a severe limitation for building sites because of the seasonal high water table. Dwellings and small buildings should be constructed without basements. Foundations and footings should be strengthened to prevent structural damage caused by low strength and shrinking and swelling of the soil. Backfilling with a coarser material will also help. Frost action and the low strength are severe limitations for local roads and streets. Surface and subsurface drainage to lower the water table will help prevent damage caused by frost action. This soil will need strengthening or replacing by more stable base material for roads to support vehicular traffic. The slow permeability and seasonal high water table are severe limitations for septic tank absorption fields. In areas where community sewage treatment systems are not available, the water table can be lowered by subsurface drainage systems and absorption fields enlarged to compensate for the slow permeability of the soil.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

Kn—Kings silty clay. This nearly level, very poorly drained soil is on lacustrine terraces. It is frequently ponded with surface runoff from adjacent higher areas. Areas range from 50 to 200 acres in size.

In a typical profile the surface layer is black silty clay about 6 inches thick, and the subsurface layer is very dark gray silty clay about 8 inches thick. The subsoil is dark gray and gray, mottled, very firm silty clay about 29 inches thick. The substratum, to a depth of 60 inches, is gray, mottled silty clay. In some places the surface layer is about 9 inches thick. A few areas adjacent to drainage ditches have a silt loam surface layer of recent overwash about 6 to 10 inches thick. In a few areas the surface layer is browner.

Included with this soil in mapping are small areas of poorly drained Birds and Patton soils. These inclusions make up 10 to 12 percent of the unit.

This Kings soil has a moderate available water capacity and very slow permeability. It has a high organic matter content in the surface layer. Surface runoff is very slow. This soil has a seasonal high water table above or near the surface during winter and early spring. The surface layer is firm and can be tilled over a narrow range in moisture content. Tillage when too dry or too wet will result in a cloddy seedbed. Drainage is needed for satisfactory crop growth.

Nearly all areas of this soil are used for cultivated crops. Areas that have not been drained are in woodland.

When adequately drained, this soil is suited to corn and soybeans. Wetness is the main limitation that affects use and management. Excessive water can be removed by open ditches, surface drains, pumping, or a combination of these practices. With drainage and proper management, this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of the soil.

When properly drained, this soil is suited to grasses and legumes for hay or pasture. When this soil is used for pasture, the major concern of management is overgrazing and grazing when wet. Grazing under wet conditions causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing will help keep the pasture and soil in good condition.

This soil is suited to trees but is seldom used for that purpose except in those areas that are undrained. The limitation for the use of equipment is severe. This soil is severely limited by the hazards of plant competition, seedling mortality, and windthrow. Harvesting and planting operations are delayed until drier periods of the year. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Species that can tolerate wet conditions are the most suitable.

The seasonal high water table, high shrink-swell potential, and ponding are severe limitations for building sites, and this soil is generally unsuited for this use. The low strength, ponding, and high shrink-swell potential are severe limitations for local roads and streets. The severe limitations for local roads and streets can be reduced by an adequate drainage system and strengthening or replacing the road base material to support vehicular traffic. The wetness, very slow permeability, and ponding are severe limitations for septic tank absorption fields, and this soil is generally unsuited for this use.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

La—Landes loamy sand. This nearly level, well drained soil is on broad flood plains adjacent to large streams. Floods are rare and brief. Areas are long and narrow and range from 3 to 60 acres in size.

In a typical profile the surface layer is very dark grayish brown loamy sand about 10 inches thick. The subsurface layers are very dark grayish brown and dark brown, very friable loamy sand about 8 inches thick. The subsoil, which extends to a depth of 35 inches, is dark yellowish brown, friable loamy sand with thin layers of fine sandy loam. The substratum, to a depth of 60 inches, is yellowish brown fine sand with layers of fine sandy loam. In a few areas there are thin layers of silt loam in the lower part of the subsoil. In some areas the soil is sandy throughout. In a few areas the surface layer is browner.

Included with this soil in mapping are long narrow areas of lower lying poorly drained Petrolia soils in sloughs. These inclusions make up 8 to 10 percent of the unit.

This Landes soil has a low available water capacity and moderately rapid over rapid permeability. It has a moderate organic matter content in the surface layer. Surface runoff is slow. This soil has a seasonal high water table at a depth of 3 to 6 feet in the spring. The surface layer is very friable and easily tilled over a wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some of the lower areas adjacent to the river are dissected by stream channels and are in woodland.

This soil is suited to corn, soybeans, grain sorghum, and small grain. Small grain crops are mostly grown in areas protected from flooding. Flooding is a hazard in use and management. Most areas that lie within levees are protected, but seepage through levees during long periods of high water in spring causes flooding in some of the lower areas. During years of below average rainfall or poor distribution, crops are subject to damage from drought. Use of conservation tillage that leaves all or part of the crop residue on the surface and planting early in spring help to reduce the potential damage from drought. Also, the use of conservation tillage that leaves all or part of the crop residue on the surface and cover crops will help maintain and improve the organic matter content and tilth of this soil.

This soil is well suited to grasses for hay and pasture. It is also well suited to deep-rooted legumes such as alfalfa in areas protected from flooding. The major concern of management is overgrazing. Proper stocking rates and timely pasture rotations will help keep the pasture in good condition.

This soil is well suited to trees. It is moderately limited by plant competition, but seedlings survive and grow well when competing vegetation is controlled by site preparation or by cutting, spraying, or girdling.

This soil is generally unsuitable for building sites and sanitary facilities because of flooding. Flooding and frost action are moderate limitations for local roads and streets. Constructing roads on raised, well-compacted fill material and providing adequate side ditches and culverts will reduce flood and frost damage.

This soil is in capability subclass IIIs and woodland suitability subclass 1o.

Lo—Lomax loam. This nearly level, well drained soil is on broad bottom lands. Most areas are protected by levees and are rarely flooded. A few areas not protected are subject to flooding during winter and early spring. Areas are irregular in shape and range from 20 to 80 acres in size.

In a typical profile the surface layer is very dark gray loam about 9 inches thick. The subsurface layer is very dark gray and very dark grayish brown loam about 16 inches thick. The subsoil is about 19 inches thick. The upper part of the subsoil is dark brown, friable loam. The lower part is dark yellowish brown, friable fine sandy loam. The substratum, to a depth of 60 inches, is dark yellowish brown fine sand with layers of fine sandy loam. This soil is mottled below a depth of 30 inches in a few areas. In a few areas the lower part of the subsoil is about 5 percent fine gravel and is underlain by coarse sand and gravelly sand. In some other areas this soil has a thinner surface layer and is less sandy.

Included with this soil in mapping are small areas of poorly drained Vincennes and Petrolia soils in depressions and channels. These inclusions make up about 7 to 10 percent of the unit.

This Lomax soil has a high available water capacity and moderately rapid permeability. The organic matter content of the surface layer is high. Surface runoff is slow.

The surface layer is friable and easily tilled over a wide range in moisture content.

Most of this soil is used for cultivated crops. Some areas are used for small grain or pasture.

This soil is suited to corn and soybeans because they can be planted and harvested during a period of least flooding, especially in areas not protected by levees. Flooding is a hazard in use and management. Except in the extreme southern part of the county, most areas are protected by levees. Seepage through levees during periods of high water causes flooding, however, in some of the lower areas. Alfalfa and small grain are occasionally drowned out in winter and early spring. With flood protection and proper management, this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. Alfalfa is subject to severe damage in areas not protected by levees. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the soil in good condition.

The suitability of this soil for trees has not been determined because of an absence of satisfactory stands for site index studies. This soil formed under prairie vegetation, and it supports few trees.

This soil is generally unsuitable for building sites and sanitary facilities because of flooding. Constructing roads on raised, well-compacted fill material and providing adequate side ditches and culverts will reduce flood and frost damage.

This soil is in capability class I. It has not been assigned to a woodland suitability subclass.

Ly—Lyles fine sandy loam. This nearly level, very poorly drained soil is in depressions on uplands and terraces. It is frequently ponded with surface runoff from adjacent higher areas. Areas are broad and irregular in shape and range from 2 to 40 acres in size.

In a typical profile the surface layer is very dark gray fine sandy loam about 10 inches thick. The subsurface layer is very dark gray fine sandy loam about 7 inches thick. The subsoil is gray and dark gray, mottled, friable fine sandy loam and loam about 37 inches thick. The substratum, to a depth of 60 inches, is grayish brown, mottled fine sand with layers of sandy loam. In a few small areas the surface layer is loam or silt loam. In some lower areas, where crops tend to be drowned out in wet years, there are thin layers of sandy clay loam in the subsoil. The surface layer is dark gray in a few areas at the rim of depressions adjacent to Bloomfield and Alvin soils.

Included with this soil in mapping are a few small slightly convex areas of somewhat poorly drained Ayrshire soils. These inclusions make up 4 to 6 percent of the unit.

This Lyles soil has a high available water capacity and moderate permeability. It has a high organic matter content in the surface layer. Surface runoff is very slow. The seasonal high water table is at or near the surface during winter and early spring. This soil has a friable surface layer that is easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. A few areas are used for hay, pasture, or woodlands.

When adequately drained, this soil is well suited to corn, soybeans, and small grain. Wetness is the main limitation that affects use and management. Excess water can be removed by open ditches, tile drains, surface drains, pumping, or a combination of these practices. With drainage and proper management, this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture, but drainage is necessary to obtain high yields. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces the plant density and plant hardiness. Proper stocking rates, rotational grazing, timely deferment of grazing, and restricted use during wet periods will help reduce surface compaction and maintain good tilth and plant densities.

This soil is suited to trees but is seldom used for this purpose. The limitation for the use of equipment is severe. This soil is severely limited by the hazards of plant competition, seedling mortality, and windthrow. Harvesting and planting operations are delayed until drier periods of the year. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by cutting, spraying, or girdling. Species that can tolerate wet conditions are the most suitable.

The prolonged seasonal high water table and ponding are severe limitations for building sites. This soil is generally unsuited for this use because it is often in the lowest part of the landscape and receives surface water runoff from adjacent slopes. Frost action and ponding are severe limitations for local roads and streets. Drainage ditches are needed along roads to lower the water table and prevent damage from frost action. The ponding is a severe limitation for septic tank absorption fields, and this soil is generally unsuited for this use.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

MbB2—Markland silt loam, 2 to 6 percent slopes, eroded. This gently sloping, well drained soil is on lacustrine plains. Areas are narrow and elongated in shape and range from 3 to 15 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is dark yellowish brown and dark brown, firm silty clay about 30 inches thick. The substratum, to a depth of 60 inches, is light olive brown, mottled silty clay. In a few areas adjacent to drainageways the surface layer is silty clay.

Included with this soil in mapping are somewhat poorly drained McGary and poorly drained Zipp soils in lower positions in the landscape. These soils make up 6 to 8 percent of this unit.

This Markland soil has a moderate available water capacity and slow permeability. Organic matter content in the surface layer is moderate. Surface runoff is medium. This soil has a seasonal high water table at a depth of 3 to 6 feet in spring. The surface layer is friable and easily tilled over a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some areas are in pasture, hay, or woodland.

This soil is suited to corn, soybeans, and small grain. When cultivated crops are grown, conservation practices are needed to control erosion. Soil loss can be reduced by practices such as crop rotation, conservation tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures. Leaving all or part of the crop residue on the surface and cover crops help to control erosion and maintain and improve the tilth and organic matter content of this soil.

This soil is suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, and a few areas are in woodlots. There is a slight limitation for the use of equipment. Hazards of seedling mortality and windthrow are severe limitations. Plant competition is a moderate limitation, but seedlings survive and grow well when competing vegetation is controlled by site preparation or by cutting, spraying, or girdling.

This soil has severe limitations for building sites. Low strength and shrinking and swelling are the main limitations. Dwellings should be constructed without basements, and foundations and footings should be strengthened to prevent structural damage caused by low strength and shrinking and swelling of the soil. Backfilling with a coarser material also helps overcome this problem. The high shrink-swell potential and low strength are severe limitations for local roads and streets. The base material for roads will need strengthening or replacing by more suitable material to support vehicular traffic. The slow permeability and wetness are severe limitations for septic tank absorption fields. Where sewer facilities are not available, absorption fields have been enlarged to reduce the effect of the slow permeability.

This soil is in capability subclass IIIe and woodland suitability subclass 2c.

McA—McGary silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on lacustrine plains. Areas are elongated in shape and range from 2 to 40 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 8 inches thick. The mottled, firm subsoil is about 29 inches thick. The upper part of the subsoil is yellowish brown silty clay, and the lower part is gray or grayish brown silty clay. The underlying material, to a depth of 60 inches, is gray, mottled silty clay with layers of silty clay loam. Small areas of a wetter, very poorly drained soil are included.

Included with this soil in mapping are well drained Markland soils on higher positions. These inclusions make up 5 to 7 percent of the unit.

This McGary soil has a moderate available water capacity and slow permeability. Organic matter content in the surface layer is moderate. Surface runoff is slow. This soil has a seasonal high water table at a depth of 1 to 3 feet during the winter and early spring. The surface layer is friable and can be tilled over a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in orchards or woodland.

When adequately drained, this soil is well suited to corn, soybeans, and small grain. Wetness is the main limitation that affects use and management. Excess water can be removed by open ditches, tile drains, surface drains, or a combination of these practices. With adequate drainage, a conservation cropping system that includes row crops most of the time is generally practiced. The use of conservation tillage that leaves all or part of the crop residue on the surface and cover crops help to maintain and improve the tilth and organic matter of this soil.

This soil is suited to grasses and legumes for hay or pasture when properly drained. When this soil is used for pasture, the major concerns of management are overgrazing and grazing when the soil is wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is suited to trees but is seldom used for that purpose. The limitation for the use of equipment is moderate. Hazards of seedling mortality and windthrow are severe limitations, and plant competition is a moderate limitation. In some years, planting or harvesting may be delayed by wetness. Species that can tolerate wet conditions are the most suitable. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by cutting, spraying, or girdling.

The high shrink-swell potential and wetness are severe limitations for building sites. Building sites on this soil must be artificially drained. Dwellings should be constructed without basements, and foundations and footings should be strengthened to prevent structural damage from shrinking and swelling of the soil. The high shrink-swell potential and low strength are severe limitations for local roads and streets. Base material should be replaced or strengthened if roads and streets are to support vehicular traffic. This soil is generally unsuited to septic tank absorption fields because of wetness and slow permeability, which are severe limitations.

This soil is in capability subclass IIIw and woodland suitability subclass 3w.

No—Nolin silty clay loam, rarely flooded. This nearly level, well drained soil is on broad bottom lands. Floods are rare and brief. Areas are usually broad in shape and range from 50 to 150 acres in size.

In a typical profile the surface layer is dark brown silty clay loam about 10 inches thick. The subsoil is about 34 inches thick. The upper part of the subsoil is brown or dark yellowish brown, firm silty clay loam. The lower part is yellowish brown, friable silt loam. The substratum, to a depth of 60 inches, is brown silt loam. In some places there are small areas of soils with less clay in the solum. Some pedons have grayish brown mottles below a depth of 24 inches.

Included with this soil in mapping are small elongated areas of poorly drained Petrolia soils and Zipp soils in old channels. These inclusions make up 3 to 6 percent of the unit.

This Nolin soil has a high available water capacity and moderate permeability. It has a moderate organic matter content in the surface layer. Surface runoff is slow. This soil has a seasonal high water table at a depth of 4 to 6 feet in spring. It has a friable surface layer that is easily tilled over a moderate range in moisture content. The surface layer becomes cloddy and hard to work if tilled when too wet.

Most areas are used for cultivated crops. Some areas that are protected from flooding are also used for growing small grain.

This soil is best suited to corn and soybeans because they can be planted and harvested during a period of least flooding, especially in the areas not protected by levees. Most areas are protected by levees, but seepage through levees during periods of high water causes some damage in the lower areas. With flood protection and proper management, this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. Alfalfa is subject to severe damage in areas not protected by levees. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help reduce surface compaction and maintain good tilth and plant densities.

This soil is suited to trees, and some areas are in hardwoods. It is moderately limited by plant competition, but seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil is generally unsuitable for building sites and sanitary facilities because of flooding. Constructing roads on raised, well-compacted fill material and providing adequate side ditches and culverts will reduce flood and frost damage.

This soil is in capability class I and woodland suitability subclass 1o.

Pb—Patton silt loam. This nearly level, poorly drained soil is on nearly level lacustrine terraces. It is sometimes ponded with surface water runoff from higher soils. Areas are usually broad and range from 15 to 80 acres in size.

In a typical profile the surface layer is black silt loam about 10 inches thick. The subsurface layer is silt loam about 7 inches thick. The subsoil is gray and dark gray, mottled, firm silty clay loam about 20 inches thick. The substratum, to a depth of about 60 inches, is mottled, yellowish brown and gray silty clay loam with layers of silt loam. Some small areas have 4 to 8 inches of lighter colored silt loam overwash material deposited on the original surface.

Included with this soil in mapping are a few small areas of finer textured, poorly drained Zipp soils. These inclusions make up 8 to 10 percent of the unit.

This Patton soil has a high available water capacity and moderate permeability. The organic matter content is high, and the surface water runoff is slow. This soil has a seasonal high water table above or within 2 feet of the surface during winter and early spring. This soil has a friable surface layer that is easily tilled over a moderate range in moisture content.

Most areas are drained and used for cultivated crops. A few areas are used for hay, pasture, or woodland.

When adequately drained, this soil is well suited to corn, soybeans, and small grain. Wetness is the main limitation that affects use and management. Excess water can be removed by open ditches, tile drains, surface drains, pumping, or a combination of these practices. With drainage and proper management, this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture, but artificial drainage of this soil is necessary to obtain high yields. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces the plant density and plant hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant densities.

This soil is suited to trees. The limitation for the use of equipment is severe. Harvesting and planting operations are delayed until drier periods of the year. This soil is severely limited by plant competition and moderately limited by the hazards of seedling mortality and windthrow. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by cutting, spraying, or girdling. Species that are tolerant to wetness are the most suitable.

Ponding is a severe limitation for building sites, and this soil is generally unsuited for this use. The seasonal high water table, a high potential for frost action, and low strength are severe limitations for local roads and streets. The upper layer of the soil should be replaced or strengthened with more suitable material if roads are to support vehicular traffic. This soil is severely limited for septic tank absorption fields by ponding and moderately slow permeability, and it is generally unsuited for this use.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

Pg—Peoga Variant silt loam. This nearly level, deep, poorly drained soil is on broad terraces. Areas are irregular in shape and range from 20 to 200 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is gray silt loam about 3 inches thick. The subsoil, which is about 44 inches thick, is gray, mottled, and firm. The upper part of the subsoil is silty clay loam, and the lower part is silty clay. The substratum, to a depth of 60 inches, is gray, mottled clay loam. The surface layer is gray in a few areas. In some places the lower part of the subsoil is silty clay loam with layers of fine sand.

Included with this soil in mapping are small areas of well drained Elkinsville soils on higher ridges and knolls. These inclusions make up 6 to 8 percent of the unit.

This Peoga Variant soil has a high available water capacity and slow permeability. The organic matter content is moderate in the surface layer. Surface runoff is slow. This soil has a seasonal high water table at or within a foot of the surface during winter and spring. The surface layer is friable and can be tilled over a fairly wide range of moisture content.

Most areas of this soil are used for cultivated crops. Some areas are used for hay, pasture, or woodlots.

Most areas of this soil have been drained with surface drains and open ditches. Wetness is the major limitation in use and management. The adequately drained areas of this soil are well suited to corn, soybeans, and small grain. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of this soil.

This soil is suited to grasses and legumes for hay and pasture, but artificial drainage is necessary to obtain high yields. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces plant densities and plant hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods will help reduce surface compaction and maintain good tilth and plant densities.

This soil is suited to trees. The limitation for the use of equipment is severe. This soil is severely limited by the hazards of plant competition and seedling mortality and moderately limited by the hazard of windthrow. Wetness usually delays harvesting of trees until dry seasons or until the ground is frozen. Species that are tolerant to wetness are the most suitable. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by cutting, spraying, or girdling.

The wetness and shrink-swell potential are severe limitations for building sites. Building sites should be artificially drained. Dwellings should be constructed without basements and foundations, and footings should be strengthened to prevent structural damage caused by shrinking and swelling of the soil. Backfilling with a coarser material will also help. This soil is severely limited for local roads and streets by wetness, a high potential for frost action, and low strength. Drainage ditches are needed along roads and streets to lower the water table and prevent damage from frost action. The upper layer of the soil should be replaced or strengthened with more suitable base material to support vehicular traffic. This soil is severely limited for septic tank absorption fields by wetness and slow permeability, and it is generally unsuited for this use.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

Po—Petrolia silty clay loam, frequently flooded. This nearly level, poorly drained soil is in depressions on broad bottom lands. It is frequently flooded (fig. 11) for long periods of time, mostly during winter and early spring. Areas are long and narrow and range from 10 to 50 acres in size.

In a typical profile the surface layer is dark grayish brown silty clay loam about 7 inches thick. The subsoil, which extends to a depth of 54 inches, is gray, mottled, firm silty clay loam. The substratum, to a depth of 60 inches, is gray silty clay loam. In some areas there are thin layers of sandy loam below a depth of 40 inches. In some places the surface layer is silt loam.

Included with this soil in mapping are a few areas of somewhat poorly drained Wakeland soils adjacent to drainageways. A few intermixed areas of sandier, poorly drained Vincennes soils are also included. These inclusions make up 10 to 12 percent of the unit.

This Petrolia soil has a high available water capacity and moderately slow permeability. The organic matter content in the surface layer is moderate. Surface runoff is very slow. This soil has a seasonal high water table at or within 3 feet of the surface during winter and early spring. It has a friable surface layer that is fairly easily tilled over a narrow range in moisture content. Tillage of this soil when it is too wet results in large clods that become very firm when they dry.

Most areas of this soil are used for cultivated crops. A few areas are used for hay and pasture. Some undrained areas are in woodland.

When adequately drained, this soil is suited to corn and soybeans. Wetness is a limitation and flooding is a hazard in use and management (fig 12). Drainage is usually difficult to establish because adequate outlets are not available in most areas. Many areas are protected by levees, but seepage through levees during periods of high water causes flooding in most areas. Alfalfa and small grain are usually drowned out in winter and early spring months. With drainage and proper management this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leave all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses for hay and pasture and poorly suited to deep-rooted legumes such as alfalfa because of wetness and damage during periods of flooding. Drainage of this soil is necessary for high yields. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods will help keep the soil in good condition.

This soil is suited to trees, and some areas are in hardwoods. There are moderate limitations for the use of equipment. This soil is severely limited by plant competition and moderately limited by the hazard of seedling mortality. Wetness delays harvesting and planting operations until drier periods of the year. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Species that are tolerant to wetness are the most suitable.

This soil is severely limited for building sites and septic tank absorption fields by the seasonal high water table and flooding, it is generally unsuited for this use. It is

Figure 11.—Flooding on Petrolia silty clay loam, frequently flooded. The higher Nolin soils in the foreground are less frequently flooded.

severely limited for local roads and streets by low strength, frost action, and flooding. Constructing roads on raised, well-compacted fill material and providing adequate side ditches and culverts will reduce flood and frost damage.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

PsA—Proctor silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on broad terraces. Areas range in size from 150 to 300 acres.

In a typical profile the surface layer is very dark gray silt loam about 15 inches thick. The subsoil is about 37 inches thick. It is dark brown, dark yellowish brown, and yellowish brown, firm silt loam and loam. The substratum, to a depth of 60 inches, is yellowish brown, fine sandy loam with layers of loam. In some areas there are gray mottles below a depth of 30 inches. The substratum in some areas has thin layers of silt loam and silty clay loam. In a few areas the surface layer is browner.

Included with this soil in mapping are small elongated areas of poorly drained Peoga Variant soils and Vincennes soils in depressions. These inclusions make up 6 to 10 percent of the unit.

This Proctor soil has a high available water capacity and moderate permeability. It has a high organic matter content in the surface layer. Surface runoff is slow. This soil has a friable surface layer that is easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for hay or pasture.

This soil is well suited to corn, soybeans, and small grain. Conservation tillage that leaves all or part of the crop residue on the surface and cover crops help to maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during the wet season will help keep the pasture and soil in good condition.

The suitability of this soil for trees has not been

Figure 12.—Corn crop damaged by floodwater on Petrolia silty clay loam.

determined because there are no satisfactory stands for site index studies. This soil formed under prairie vegetation and supports few trees.

This soil has a moderate limitation for building sites. Foundations, footings, and basement walls should be strengthened to prevent structural damage caused by shrinking and swelling of the soil. Backfilling with a coarser material will help overcome this problem. It is severely limited for local roads and streets by low strength and frost action. This soil should be strengthened with a more suitable base material so roads can support vehicular traffic. It has a slight limitation for septic tank absorption fields.

This soil is in capability class I. It has not been assigned to a woodland suitability subclass.

Ra—Ragsdale silt loam. This nearly level, very poorly drained soil is on large nearly level flats or slight depressions. It is frequently ponded by surface runoff from adjacent higher soils. Areas are irregular in shape and range from 2 to 200 acres in size.

In a typical profile the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is very dark brown silt loam and is also about 9 inches thick. The subsoil is grayish brown and yellowish brown, mottled, firm silty clay loam about 28 inches thick. The substratum, to a depth of 60 inches, is mottled, yellowish brown and gray silt loam. In some areas the surface layer is black silty clay loam. The surface layer is thicker in these areas, and the subsoil is grayer. In a few areas there is 6 to 14 inches of overwash material deposited on the original surface layer.

Included with this soil in mapping are small areas of somewhat poorly drained Reesville soils and moderately well drained Iona soils on higher positions in the landscape. These inclusions make up 6 to 10 percent of the unit.

This Ragsdale soil has a very high available water capacity and slow permeability. The organic matter content in the surface layer is high. Surface runoff is very slow. This soil has a seasonal high water table above or within 1 foot of the surface during the winter and early spring. This soil has a friable surface layer that is easy to till over a fairly wide range in moisture content.

Most areas are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

When adequately drained, this soil is well suited to corn, soybeans, and small grain. Wetness is the main limitation that affects use and management. Excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these practices. With drainage and proper management, this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture, but artificial drainage is necessary to obtain high yields. Overgrazing and grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces the plant density and plant hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods will help reduce surface compaction and maintain good tilth and plant densities.

This soil is suited to trees, but the limitation for the use of equipment is severe. The hazards of plant competition, seedling mortality, and windthrow are severe. Wetness usually delays harvesting of trees until extremely dry seasons or until the ground is frozen. Species that tolerate wetness are the most suitable. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil is severely limited for building sites because of the seasonal high water table and ponding. It is generally unsuited for this use. This soil is severely limited for local roads and streets because of the seasonal high water table, ponding, low strength, and frost action. Drainage ditches are needed along roads to lower the water table, and roadbeds should be elevated to prevent damage from frost action and ponding. The upper layer of the soil should be replaced or strengthened with more suitable material. Septic tank absorption fields are severely limited by ponding, slow permeability, and a water table at or near the surface. This soil is generally unsuited for this use.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

ReA—Reesville silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad flats of the uplands. Areas are broad and irregular in shape. They range from 10 to 200 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled silt loam about 5 inches thick. The subsoil is mottled and is about 28 inches thick. The upper part of the subsoil is dark yellowish brown, firm silty clay loam; the middle is light olive brown, firm silty clay loam; and the lower part is light olive brown, friable silt loam. The substratum, to a depth of 60 inches, is grayish brown, mottled silt loam.

Included with this soil in mapping are small areas of moderately well drained Iona soils and well drained Sylvan soils in higher positions and also in areas adjacent to drainageways. Small areas of very poorly drained Ragsdale soils in depressions are also included. These inclusions make up 8 to 10 percent of the unit.

This Reesville soil has a high available water capacity and moderately slow permeability. The organic matter content is moderate. Surface runoff is slow. This soil has a seasonal high water table at a depth of 1 to 2 feet during winter and early spring. The surface layer is friable and easily tilled over a wide range in moisture content.

Nearly all areas are used for cultivated crops. Some areas are in grass or legumes used for hay or pasture. Few areas are in woodland.

This soil is well suited to corn, soybeans, small grain, and hay and pasture. Wetness is the major limitation in use and management. With adequate drainage, a conservation cropping system that usually includes row crops is generally practiced. Random subsurface drains in lower areas collect excess water runoff and help control wetness. The use of conservation tillage that leaves all or part of the crop residue on the surface and cover crops help to maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. It is moderately limited by plant competition, but seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil is severely limited for building sites by the seasonal high water table. Dwellings and small buildings should be constructed without basements, and foundations and footings should be strengthened to prevent structural damage caused by shrinking and swelling of the soil. The severe limitation for local roads and streets can be overcome by providing ditches along the road to lower the water table and help prevent structural damage caused by frost action in the soil. This soil will need strengthening or replacing by more suitable base material for roads. It is severely limited for septic tank absorption fields by the seasonal high water table and moderately slow permeability. In areas where community sewage treatment systems are not available, the water table can be lowered by drainage systems and absorption fields can be enlarged to compensate for the moderately slow permeability.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

Sa—Selma loam. This nearly level, poorly drained soil is in slightly concave positions on broad outwash terraces. Areas are broad and range from 40 to 200 acres in size.

In a typical profile the surface layer is very dark gray loam about 9 inches thick. The subsurface layer, about 6 inches thick, is also very dark gray loam. The subsoil, which is about 37 inches thick, is mottled and firm. The upper part of the subsoil is dark gray sandy clay loam, and the lower part is dark gray and gray clay loam and sandy clay loam. The substratum, to a depth of 60 inches, is light gray, stratified loamy sand, sand, and sandy loam. In some areas the surface layer is sandy loam. It is brown in a few small areas. Some small areas are underlain with gravelly sand below a depth of 50 inches.

Included with this soil in mapping are small areas of Ayrshire soils on slightly higher rises. These inclusions make up about 10 percent of the unit.

This Selma soil has a high available water capacity and moderate permeability. Organic matter content in the surface layer is high. Surface runoff is very slow. This soil has a seasonal high water table at or within 2 feet of the surface during the winter and early spring. It has a friable surface layer and is easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for grass and legumes for hay and pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness is the major limitation in use and management. With adequate drainage, a conservation cropping system can be used that includes row crops most of the time. Open ditches and surface drains throughout the area help to control wetness. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the organic matter content and good tilth of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is suited to trees but is seldom used for that purpose. There is a severe limitation for the use of equipment. This soil is severely limited by the hazards of plant competition, seedling mortality, and windthrow. Species that are tolerant to wetness are the most suitable. Wetness usually delays harvesting of trees until dry seasons or until the ground is frozen. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by cutting, spraying, or girdling.

This soil is severely limited for building sites because of wetness, and it is generally unsuitable for this use. Building sites must be artificially drained. Dwellings should be constructed without basements. Foundations and footings should be strengthened to prevent structural damage caused by the high water table. This soil is severely limited for local roads and streets by low strength, wetness, and frost action. Drainage ditches are needed along roads to lower the water table, and roadbeds should be elevated to prevent damage from frost action. If local roads and streets are to support vehicular traffic, this soil should be replaced or strengthened with a more suitable base material. This soil is severely limited for septic tank absorption fields by the seasonal high water table and wetness. It is generally unsuited to this use.

This soil is in capability subclass IIw. It has not been assigned to a woodland suitability subclass.

Sc—Selma clay loam. This nearly level, poorly drained soil is in slightly concave positions on broad outwash terraces. Areas are long and narrow in shape and range from 40 to 100 acres in size.

In a typical profile the surface layer is very dark gray clay loam about 7 inches thick. The subsurface layer is very dark gray clay loam about 9 inches thick. The subsoil is dark gray and gray, mottled, firm sandy clay loam about 37 inches thick. The substratum, to a depth of 60 inches, is grayish brown coarse sand with layers of very coarse sand and loamy sand. In some areas the surface layer is loam. It is brown in some small areas.

Included with this soil in mapping are small areas of very poorly drained Edwards Variant muck and Zipp soils along old sloughs and channels. These inclusions make up 8 to 10 percent of the unit.

This Selma soil has a high available water capacity and moderate permeability. Organic matter content in the surface layer is high. Surface runoff is very slow. This soil has a seasonal high water table at or within 2 feet of the surface during the winter and early spring. The surface layer becomes cloddy and hard to work if tilled too wet.

Most areas are used for cultivated crops. Some areas are used for grasses and legumes for hay and pasture.

This soil is well suited to corn, soybeans, and small grain. Wetness is the major limitation in use and management. With adequate drainage, a conservation cropping system can be used that includes row crops most of the time. Open ditches and surface drains throughout the area help to control wetness. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the organic matter content and good tilth of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is suited to trees but is seldom used for that purpose. There is a severe limitation for the use of equipment. This soil is severely limited by the hazards of plant competition, seedling mortality, and windthrow. Species that are tolerant to wetness are the most suitable. Wetness usually delays harvesting of trees until dry seasons or until the ground is frozen. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by cutting, spraying, or girdling.

This soil is severely limited for building by wetness, and it is generally unsuitable for this use. Building sites must be artificially drained. Dwellings should be constructed without basements, and foundations and footings should be strengthened to prevent structural damage caused by the high water table. This soil is severely limited for local roads and streets by low strength, wetness, and frost action. Drainage ditches are needed along roads to lower the water table, and roadbeds should be elevated. If roads are to support vehicular traffic, this soil should be replaced or strengthened with a more suitable base material. This soil is severely limited for septic tank absorption fields by the seasonal high water table and wetness, and it is generally unsuited for this use.

This soil is in capability subclass IIw. It has not been assigned to a woodland suitability subclass.

SdA—Stockland sandy loam, 0 to 2 percent slopes. This nearly level, well drained soil is on broad outwash terraces. Areas are irregular in shape and range from 60 to 150 acres in size.

In a typical profile the surface layer is black sandy loam about 10 inches thick. The subsurface layer is very dark brown sandy loam about 7 inches thick. The subsoil is about 63 inches thick. The upper part of the subsoil is dark brown and brown, friable very gravelly sandy loam and gravelly sandy loam. The lower part is dark yellowish brown, loose very gravelly loamy sand. In some areas the surface layer is loamy fine sand, and the depth to gravel is greater than 20 inches.

Included with this soil in mapping are small areas in lower positions of poorly drained Selma soils and somewhat poorly drained Ayrshire soils. These inclusions make up about 6 to 8 percent of the unit.

This Stockland soil has a low available water capacity and moderately rapid permeability. It has a moderate organic matter content in the surface layer. Surface runoff is slow. The surface layer is very friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Many areas are used for irrigated vegetable crops, and a few areas are used for hay or pasture.

This soil is suited to corn, soybeans, grain sorghum, small grain, irrigated vegetable crops, and hay or pasture. The low available water capacity is a limitation. During years of below average or poorly distributed rainfall, crops are subject to severe damage from drought. Use of conservation tillage that leaves all or part of the crop residue on the surface and planting early in spring help to overcome the potential damage to crops from drought. Many areas are irrigated by sprinklers, and crop yields have increased appreciably. The use of cover crops help to control soil blowing and maintain and improve the organic matter content of this soil.

The use of this soil for grasses and legumes for hay or pasture is also effective in controlling soil blowing. Proper stocking rates and pasture rotation will help keep the pasture and soil in good condition.

This soil has a slight limitation for building sites. It is moderately limited for local roads and streets by frost action. If roads are to support vehicular traffic, the base material should be strengthened or replaced. This soil is severely limited for septic tank absorption fields, and seepage of effluent into ground water supplies may become a problem.

This soil is in capability subclass IIIs. It has not been assigned to a woodland suitability subclass.

SyB2—Sylvan silt loam, 2 to 6 percent slopes, eroded. This gently sloping, well drained soil is on convex ridgetops and side slopes of the uplands. Areas are usually broad and irregular in shape and range from 2 to 50 acres in size.

In a typical profile the surface layer is dark brown silt loam about 7 inches thick. The subsoil is dark yellowish brown and yellowish brown, firm silty clay loam and light olive brown, friable silt loam about 31 inches thick. The substratum, to a depth of about 60 inches, is light brownish gray, mottled silt loam. In some areas the solum is 50 inches thick.

Included with this soil in mapping are small areas of well drained Hosmer soils in higher positions in the landscape and somewhat poorly drained Reesville soils at the heads of drainageways. These inclusions make up about 10 to 12 percent of the unit.

This Sylvan soil has a high available water capacity and moderate permeability. The organic matter content is moderate. Surface runoff is medium. The surface layer is friable and easily tilled over a wide range in moisture content.

Most areas are used for cultivated crops. Some areas are used for hay and pasture, and a few areas are used for orchards or woodlands.

This soil is well suited to corn, soybeans, and small grain. Conservation practices are needed to control erosion and surface water runoff when cultivated crops are grown. Soil loss can be reduced by practices such as crop rotation, conservation tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures. Cover crops and leaving all or part of the crop residue on the surface also help to maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotations, and timely deferment of grazing are essential to keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. It is moderately limited by plant competition, but seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil is moderately limited for building sites by the moderate shrink-swell potential. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarser material will help prevent structural damage. This soil is severely limited for local roads and streets by frost action and low strength. The base material for roads will need strengthening or replacing by more suitable material. This soil is slightly limited for septic tank absorption fields.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

SyC3—Sylvan silt loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, well drained soil is on convex or concave linear side slopes between the ridgetops and drainageways of the uplands. Areas are irregular in shape and range from 2 to 40 acres in size.

In a typical profile the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil is yellowish brown, firm silty clay loam and yellowish brown, mottled, friable silt loam about 23 inches thick. The substratum, to a depth of about 60 inches, is mottled, yellowish brown and light brownish gray silt loam. In a few areas calcareous material is exposed at the surface. In some areas, the solum is strongly acid below a depth of 40 inches.

Included with this soil in mapping are small narrow areas of somewhat poorly drained Wakeland soils adjacent to small drainageways. Also included are small areas of somewhat poorly drained Reesville soils at the heads of drainageways. These inclusions make up about 6 to 8 percent of the unit.

This Sylvan soil has a high available water capacity and moderate permeability. The organic matter content is low because of erosion of the surface layer. Surface runoff is rapid. The surface layer is friable. Tillage over a moderate range in moisture content reduces the tendency of compaction and clodding.

Most areas of this soil are used for cultivated crops. Some areas are used for hay and pasture, and a few areas are used for orchards or woodland.

This soil is not well suited to corn and soybeans because of the severe hazard of erosion. It is suited for small grain. Conservation practices are needed to control water erosion and surface runoff when cultivated crops are grown. Soil loss can be reduced by practices such as crop rotations, conservation tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures. Cover crops and leaving all or part of the crop residue on the surface help to control erosion and maintain and improve the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotations are essential to keep the pasture and soil in good condition.

This soil is well suited to trees but is seldom used for that purpose. It is moderately limited by plant competition, but seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil is moderately limited for building sites by the slope and moderate shrink-swell potential. Sites should be graded or buildings should be designed to complement slopes. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarser material will help to prevent structural damage caused by shrinking and swelling of the soil. Removal of vegetation should be kept to a minimum and exposed areas revegetated as soon as possible. This soil is severely limited for local roads and streets by frost action and low strength. If roads are to support vehicular traffic this soil must be strengthened with a more suitable base material. It is moderately limited for septic tank absorption fields by slope. Land shaping and installing the distribution lines across the slope is generally necessary for proper functioning of absorption fields.

This soil is in capability subclass IVe and woodland suitability subclass 2o.

SyD3—Sylvan silt loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, well drained soil is on side slopes between ridgetops and drainageways of the uplands. Areas are long and narrow and range from 2 to 25 acres in size.

In a typical profile the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil is yellowish brown, firm silty clay loam and yellowish brown, friable silt loam about 20 inches thick. The substratum, to a depth of about 60 inches, is mottled, light olive brown and light brownish gray silt loam. In some areas calcareous underlying material is exposed at the surface.

Included with this soil in mapping are small areas of nearly level somewhat poorly drained Wakeland soils adjacent to small drainageways. Also included are small areas of somewhat poorly drained Reesville soils at the heads of small draws. These inclusions make up about 6 to 8 percent of the unit.

This Sylvan soil has a high available water capacity and moderate permeability. The organic matter content is low because of erosion of the surface layer. Surface runoff is very rapid. The surface layer is firm. Restricting tillage to a fairly narrow range in moisture content reduces the tendency of compaction and clodding.

Some areas of this soil are used for cultivated crops; other areas are used for growing grasses and legumes for forage or pasture. A few areas are in orchards or woodland.

This soil is generally unsuited to corn and soybeans because of the very severe hazard of erosion. Small grain is occasionally grown so that stands of grasses and legumes can be reestablished.

This soil is suited to grasses and legumes for forage and pasture. Some areas are often left in grass because of the difficulty in establishing seedings. When this soil is used for pasture, overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is well suited to trees, and many areas are in woodland. It is moderately limited by plant competition, but seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil is severely limited for building sites. Slopes must be modified, and buildings should be designed to complement slopes. Foundations, footings, and basement walls should be strengthened, and backfilling with a coarser material will help to prevent structural damage caused by shrinking and swelling of the soil. Removal of vegetation should be kept to a minimum, and exposed areas revegetated as soon as possible. This soil is severely limited for local roads and streets. Cuts and fills are needed and roads should be built on the contour where possible. This soil must be strengthened with more suitable base material if roads are to support vehicular traffic. It is severely limited for septic tank absorption fields. Lateral distribution lines must be installed across the slope for proper functioning of absorption fields, or nearby alternate sites on ridgetops should be selected.

This soil is in capability subclass VIe and woodland suitability subclass 2r.

SyF—Sylvan silt loam, 25 to 40 percent slopes. This steep and very steep, well drained soil is on side slopes and breaks adjacent to drainageways. Slopes are short, and areas are long and narrow in shape and range from 5 to 100 acres in size.

In a typical profile the surface layer is very dark gray silt loam about 2 inches thick. The subsurface layer is dark grayish brown about 5 inches thick. The subsoil is dark yellowish brown, firm silty clay loam and yellowish brown, friable silt loam about 28 inches thick. The substratum, to a depth of about 60 inches, is mottled, light brownish gray, brownish yellow, and yellowish brown silt loam.

Included with this soil in mapping are small areas of Wakeland soils along small drainage channels. These inclusions make up 10 to 12 percent of the unit.

This Sylvan soil has a high available water capacity and moderate permeability. The organic matter content is moderate in wooded areas and low in pasture areas. Surface runoff is very rapid.

Most areas are in woodland (fig. 13). A few areas are used for grasses and legumes for forage or pasture.

This soil is not suited to corn and soybeans because of the slope and very severe hazard of erosion. Small grain is occasionally grown so that stands of grasses and legumes can be reestablished.

This soil is poorly suited to grasses and legumes for forage or pasture. When this soil is used for pasture, overgrazing or grazing when the soil is too wet causes surface compaction and excessive runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep this soil in good condition.

This soil is well suited to trees, and many areas are in woodland. There is a moderate limitation to the use of equipment. This soil is moderately limited by the hazards of plant competition, seedling mortality, and erosion. Logging roads can often be located on ridgetops. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Removal of vegetation should be kept to a minimum, and exposed areas revegetated as soon as possible.

This soil is severely limited for building sites, local roads and streets, and septic tank absorption fields by the steep and very steep slopes, and it is generally unsuited for this use. Removal of vegetation should be held to a minimum, and temporary plant cover should be established as quickly as possible on disturbed areas so that soil loss can be held to a minimum.

This soil is in capability subclass VIe and woodland suitability subclass 2r.

UdB—Udorthents, gently sloping. These gently sloping, excessively drained soils are on outwash plains adjacent to water-filled pits. Areas are generally rectangular and range from 5 to 60 acres.

These soils are variable, but one of the more common profiles has layers of sand and gravelly sand to a depth of 60 inches. This material consists of sands and fine gravel separated out during gravel mining operations. After mining operations, most areas are graded and used for building sites and for parks and recreation facilities.

A few areas of mounds of sand and gravelly material are left ungraded. These areas are in volunteer

Figure 13.—Woodlot of hardwoods on Sylvan silt loam, 25 to 40 percent slopes.

hardwoods, weeds, and grasses. Included are some lower areas where the water table is at or near the surface. These areas are marshy and contain cottonwood, willows, cattails, and marsh grasses.

These Udorthents are poorly suited to row crops, even after land shaping and smoothing. They are suited to grasses for cover, but seedings are difficult to establish and maintain because of the very low available water capacity of the soil. These soils are also suited to adapted shrubs and trees.

After smoothing and shaping, the higher areas are slightly limited for building sites and local roads and streets. These soils are severely limited for septic tank absorption fields by the very rapid permeability and the danger of polluting shallow water supplies.

This unit is not assigned to a capability subclass or woodland suitability subclass.

Vn—Vincennes loam. This nearly level, poorly drained soil is on broad, nearly level stream terraces. It is rarely flooded with surface runoff from adjacent higher soils. Areas are usually elongated and irregular in shape and range from 10 to 100 acres in size.

In a typical profile the surface layer is dark grayish brown loam about 10 inches thick. The subsoil is gray, mottled, friable or firm clay loam about 44 inches thick. The substratum, to a depth of about 60 inches, is mottled, light brownish gray, yellowish brown and grayish brown sandy loam with layers of clay loam. In some areas the surface layer is silty clay loam or clay loam.

Included with this soil in mapping are small areas of somewhat poorly drained Ayrshire soils and poorly drained Zipp soils along the edges of sloughs. These inclusions make up 6 to 10 percent of the unit.

This Vincennes soil has a high available water capacity and slow permeability. The organic matter content is moderate. Surface runoff is very slow. This soil has a seasonal high water table at or within 1 foot of the surface during winter and early spring. The surface layer is friable and easily tilled over a wide range in moisture content. Adequate drainage practices are needed for best growth of crops.

Nearly all areas of this soil are used for cultivated crops. Some areas are used for grass or legumes for hay and small grain. Very few areas are in woodland.

When drained this soil is well suited to corn, soybeans, small grain, and hay and pasture. Drainage has been established in most areas. Wetness is the major limitation in use and management. With adequate drainage, a conservation cropping system can be used that includes row crops most of the time. Many areas are used for hay crops. Many large drainage ditches and shallow surface drainageways throughout the area help to control wetness. The use of cover crops and conservation tillage that leaves all or part of the crop residue on the surface help to maintain and improve the organic matter content and good tilth of this soil.

This soil is well suited to grasses and legumes for hay or pasture. When used for pasture, the major concerns of management are overgrazing and grazing when wet. Grazing when wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is suited to trees but is seldom used for that purpose. There is a severe limitation for the use of equipment. This soil is severely limited by the hazards of plant competition and seedling mortality, and it is moderately limited by the hazard of windthrow. Wetness delays harvesting and planting until drier periods of the year. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Species that can tolerate wet conditions are the most suitable.

This soil is severely limited for building sites by flooding and wetness, and it is generally unsuited to this use. It is severely limited for local roads and streets by wetness, frost action, and low strength. Constructing roads on raised, well-compacted fill material and providing adequate side ditches and culverts will reduce flood and frost damage. This soil is severely limited for septic tank absorption fields by the seasonal high water table and slow permeability, and it is generally unsuited to this use.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

Vo—Vincennes clay loam, gravelly substratum. This nearly level, poorly drained soil is on broad outwash terraces. It is frequently ponded with surface runoff from adjacent higher soils. Areas are large and elongated in shape and range from 20 to 150 acres in size.

In a typical profile the surface layer is dark gray clay loam about 9 inches thick. The subsoil is dark gray, mottled, firm clay loam about 46 inches thick. The substratum, to a depth of about 60 inches, is gray, mottled gravelly clay loam. The surface layer in some areas is loam or silty clay loam. The substratum in some areas is gravelly sandy loam or gravelly sand. A few areas have a darker surface layer.

Included with this soil in mapping are areas of somewhat poorly drained Ayrshire soils and well drained Conotton soils on the higher ridges and knolls. These inclusions make up about 8 percent of the unit.

This Vincennes soil has a high available water capacity and slow permeability. The organic matter content is moderate. Surface runoff is very slow. This soil has a seasonal high water table above or within 1 foot below the surface during winter and early spring. In some areas it is also subject to frequent, brief flooding during this time of the year if not protected by levees. The surface layer is firm. Tillage should be restricted to a moderate range of moisture content to prevent clodding. Drainage is needed for best growth of crops.

Most areas are used for cultivated crops. Some areas are used for grass and legumes for hay and pasture. Very few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. Wetness is the major limitation in use and management. With adequate drainage, however, a conservation cropping system can be used that includes row crops most of the time. Many large drainage ditches and shallow surface drainageways throughout the area help to control wetness. The use of cover crops and conservation tillage that leaves all or part of the crop residue on the surface helps maintain and improve the organic matter content and good tilth of this soil.

This soil is well suited to grasses and legumes for hay or pasture. When used for pasture, the major concerns of management are overgrazing and grazing when wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is suited to trees but is seldom used for that purpose. There is a severe limitation for the use of equipment. This soil is severely limited by the hazards of plant competition and seedling mortality, and it is moderately limited by the hazard of windthrow. Wetness delays harvesting and planting until drier periods of the year. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Species that can tolerate wet conditions are the most suitable.

This soil is severely limited for building sites by surface ponding and wetness, and it is generally unsuited to this use. It is severely limited for local roads and streets by ponding, low strength, and a high potential for frost action. Constructing roads on raised, well-compacted fill material and providing adequate side ditches and culverts will reduce ponding and frost damage. This soil is severely limited for septic tank absorption fields by ponding and slow permeability, and it is generally unsuited to this use.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

Wa—Wakeland silt loam, frequently flooded. This nearly level, somewhat poorly drained soil is in narrow bottom lands. It is frequently flooded for brief periods in the winter and spring. Areas are long and narrow in shape and range from 10 to 70 acres in size.

In a typical profile the surface layer is grayish brown silt loam about 7 inches thick. The substratum, to a depth of about 60 inches, is grayish brown, mottled, friable silt loam. In a few areas there are grayer soils that contain more clay.

Included with this soil in mapping are small areas of well drained Haymond soils near natural drainageways. These inclusions make up 5 to 8 percent of the unit.

This Wakeland soil has a very high available water capacity and moderate permeability. It has a moderate organic matter content in the surface layer. Surface runoff is very slow. This soil has a seasonal high water table at a depth of 1 to 3 feet during winter and spring. The surface layer is friable and has good tilth over a wide range in moisture content.

Most areas are used for cultivated crops. Many areas are also used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Wetness is a major limitation, and flooding is a major hazard in use and management. With proper drainage, a conservation cropping system can be used that includes row crops most of the time. It is difficult to grow row crops on undrained areas of this soil, and crops often must be replanted because flooding and surface water have destroyed stands. Other conservation practices such as cover crops and conservation tillage that leaves all or part of the crop residue on the surface will help maintain and improve the organic matter content and tilth of this soil.

This soil is well suited to grasses for hay and pasture and poorly suited to deep-rooted legumes such as alfalfa because of wetness and damage during periods of flooding. Drainage is necessary for high yields. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods will help keep the soil in good condition.

This soil is suited to trees, and some areas are in hardwoods. It is moderately limited by plant competition, but seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling.

This soil is severely limited for building sites, local roads and streets, and septic tank absorption fields by the flooding and wetness. It is generally unsuited to these uses.

This soil is in capability subclass IIIw and woodland suitability subclass 2o.

Wb—Wallkill silt loam. This nearly level, very poorly drained soil is in old river channels. It is frequently flooded, and the water table is at or near the surface most of the year. Areas are about 400 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 3 inches thick. The subsoil layer is gray, mottled silt loam about 14 inches thick. Below this, there are organic layers that are very dark gray and black, friable muck to a depth of about 60 inches. In some areas the muck is only 8 inches below the surface. There are layers of silty clay below a depth of 50 inches in some areas.

Included with this soil in mapping are small areas of very poorly drained Kings soils and poorly drained Zipp soils near the edges of the sloughs. These inclusions make up 8 to 10 percent of the unit.

This Wallkill soil has a very high available water capacity. Permeability is moderate or moderately rapid in the upper part of the profile and varies widely in the lower part. This soil has a very high organic matter content. Surface runoff is very slow. This soil has a seasonal high water table at or near the surface most of the year. The surface layer is friable and is easily tilled over a wide range in moisture content. Drainage practices are needed for satisfactory crop growth.

Most areas are in woodland. A few areas are drained and used for cultivated crops.

When adequately drained, this soil is suited to corn and soybeans. Wetness is the main limitation, and flooding is a hazard that affects use and management. Excess water can be removed by open ditches, subsurface drains, surface drains, pumping, or a combination of these practices. Outlets are difficult to establish. With drainage and proper management, this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of the soil.

When properly drained, this soil is suited to grasses and legumes for hay or pasture. The major concern of pasture management is overgrazing or grazing when wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotations, and timely deferment of grazing will help keep the pasture and soil in good condition.

This soil is suited to trees, and most areas are in woodland. There is a severe limitation to the use of equipment. This soil is severely limited by the hazards of plant competition, seedling mortality, and windthrow. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Species that can tolerate wet conditions are the most suitable.

This soil is severely limited for building sites by flooding, wetness, and low strength. It is severely limited for local roads and streets by wetness, flooding, and frost action. It is severely limited for septic tank absorption fields by flooding and wetness. This soil is generally unsuited to these uses.

This soil is in capability subclass IVw and woodland suitability subclass 4w.

Wc—Wallkill silt loam, clayey substratum. This nearly level, very poorly drained soil is on lacustrine terraces. It is ponded with surface water runoff from adjacent higher soils. Areas are about 300 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 11 inches thick. The subsurface layer is grayish brown, mottled silt loam about 7 inches thick. Below this are organic layers of black and very dark gray muck to a depth of 42 inches. The substratum, to a depth of about 60 inches, is black, firm silty clay. In some areas the muck is only 12 inches below the surface.

Included with this soil in mapping are small areas of very poorly drained Kings soils in depressions. Also included are a few areas of well drained Haymond soils. These inclusions make up about 6 to 10 percent of the unit.

This Wallkill soil has a very high available water capacity. Permeability is moderate or moderately rapid in the upper part of the profile but varies widely in the lower part. It is slow in the substratum. Organic matter content is moderate. Surface runoff is very slow. This soil has a seasonal high water table above or just below the surface from late summer through spring. The surface layer is friable and is easily tilled over a wide range in moisture content. Drainage practices are needed for satisfactory crop growth.

All areas of this soil are used for cultivated crops. When adequately drained, this soil is suited to corn and soybeans. Wetness is the main limitation that affects use and management. Excess water can be removed by open ditches, subsurface drains, surface drains, pumping, or a combination of these practices. With drainage and proper management, this soil is suited to intensive row cropping. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface help maintain and improve the tilth and organic matter content of the soil.

This soil is suited to grasses and legumes for hay or pasture when properly drained. When this soil is used for pasture, the major concern of management is overgrazing or grazing when wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotations, and timely deferment of grazing will help keep the pasture and soil in good condition.

This soil is not suited to commercial timber production. There is a severe limitation to the use of equipment. This soil is severely limited by the hazards of plant competition, seedling mortality, and windthrow.

This soil is severely limited for building sites by ponding and low strength. It is severely limited for local roads and streets by ponding, low strength, and frost action. It is severely limited for septic tank absorption fields by ponding and slow permeability. This soil is generally unsuited to these uses.

This soil is in capability subclass IIIw and woodland suitability subclass 4w.

Zp—Zipp silty clay. This nearly level, very poorly drained soil is on broad, slightly concave terraces. It is frequently ponded by surface water runoff from adjacent higher soils. Areas are broad in shape and range from 40 to 200 acres in size.

In a typical profile the surface layer is dark gray silty clay about 5 inches thick. The subsoil is dark gray, mottled, firm or very firm silty clay about 31 inches thick. The substratum, to a depth of about 60 inches, is mottled gray and yellowish brown silty clay. In some areas there is a 6- to 8-inch layer of silt loam overwash over the original surface layer.

Included with this soil in mapping are small areas of poorly drained Birds soils and somewhat poorly drained Wakeland soils along drainageways. These inclusions make up 6 to 12 percent of the unit.

This Zipp soil has a moderate available water capacity and very slow permeability. The organic matter content is moderate. Surface runoff is very slow. This soil has a seasonal high water table above or within a foot below the surface during winter and early spring. The surface layer is firm and can be tilled over a narrow range in moisture content. Tillage when the soil is too dry or too wet will result in a cloddy seedbed. Drainage is needed for satisfactory crop growth.

Most areas are used for cultivated crops. Some areas are used for small grain, hay, and pasture. Areas that have not been drained are in woodland.

This soil is suited to corn, soybeans, and small grain in most areas that have been drained. Wetness is the major hazard in use and management. With adequate drainage, however, a conservation cropping system can be used that includes row crops most of the time. Small grain and hay crops are sometimes drowned out in winter and early spring by surface ponding. Many large drainage ditches and shallow surface drainageways throughout the area help to control wetness. Conservation tillage that leaves all or part of the crop residue on the surface help maintain organic matter content and good tilth of this soil.

This soil is suited to grasses for hay or pasture when properly drained. When this soil is used for pasture, the major concerns of management are overgrazing and grazing when the soil is wet. Grazing under wet conditions causes surface compaction and poor tilth. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is suited to trees but is seldom used for woodland except in those areas that are undrained. There is a severe limitation for the use of equipment. This soil is severely limited by the hazards of plant competition, seedling mortality, and windthrow. Wetness delays harvesting and planting until drier periods of the year. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Species that can tolerate wet conditions are most suitable.

This soil is severely limited for building sites and by a high shrink-swell potential and the ponding. It is severely limited for local roads and streets because of the ponding, high shrink-swell potential, and low strength. Drainage is needed to lower the water table and prevent damage from frost action. The base material should be replaced or strengthened if roads are to support vehicular traffic. This soil is severely limited for septic tank absorption fields because of the ponding and very slow permeability. It is generally unsuited to these uses.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

Zt—Zipp silty clay, frequently flooded. This nearly level, very poorly drained soil is in narrow elongated areas that were former stream channels or sloughs. It is frequently flooded by surface runoff from higher soils or seepage through levees. Areas are long and narrow and range from 20 to 100 acres in size.

In a typical profile the surface layer is dark gray silty clay about 6 inches thick. The subsoil is dark gray and gray, mottled, firm or very firm silty clay about 33 inches thick. The substratum, to a depth of about 60 inches, is mottled, gray and yellowish brown silty clay. In a few areas the substratum contains thin layers of silt loam and fine sand below a depth of 40 inches. Some areas have a darker surface layer.

Included with this soil in mapping are small areas of poorly drained Selma soils and Vincennes soils next to the uplands. These inclusions make up about 10 to 15 percent of the unit.

This Zipp soil has a moderate available water capacity and very slow permeability. The organic matter content is moderate. Surface runoff is very slow, and this soil is frequently flooded. It has a seasonal high water table above or within a foot below the surface during winter and early spring. The surface layer is firm and can be tilled over a narrow range in moisture content. Tillage when the soil is too dry or too wet results in cloddy seedbeds. Drainage is needed for satisfactory crop growth.

Most areas are used for cultivated crops. Lower areas that have a greater overflow hazard or those areas that have not been drained are in woodland.

This soil is suited to corn and soybeans in most drained areas. Small grain crops are often drowned out by flooding during winter and early spring. Wetness is the major limitation, and flooding is a hazard in use and management. With adequate drainage, a conservation cropping system should be used that includes row crops most of the time. Small grain and hay crops are frequently drowned out in winter and early spring by flooding. Corn and soybean crops are sometimes lost during the growing season. Shallow surface drainage helps control wetness. Conservation tillage that leaves all or part of the crop residue on the surface helps maintain organic matter content and good tilth of this soil.

This soil is suited to grasses for hay and pasture when properly drained, but some stands are subject to damage from flooding. When this soil is used for pasture, the major concerns of management are overgrazing and grazing when the soil is wet. Grazing under wet conditions causes surface compaction and poor tilth. Proper stocking rates, pasture rotations, timely deferment of grazing, and restricted use during wet periods will help keep the pasture and soil in good condition.

This soil is suited to trees. There is a severe limitation for the use of equipment. This soil is severely limited by the hazards of plant competition, seedling mortality, and windthrow. Wetness delays harvesting and planting until drier periods of the year. Seedlings survive and grow well when competing vegetation is controlled by site preparation or by spraying, cutting, or girdling. Species that tolerate wet conditions are the most suitable.

This soil is severely limited for building sites and for local roads and streets by ponding, a high shrink-swell potential, and flooding. Drainage is needed to lower the water table to prevent damage from frost action, and this soil must be protected from flooding. The base material should be replaced or strengthened if roads are to support vehicular traffic. This soil is severely limited for septic tank absorption fields by the flooding and very slow permeability. This soil is generally unsuited to these uses.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

prime farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. Because the amount of high quality farmland is limited, it should be used with wisdom and foresight.

Prime farmland is the land best suited to producing food, feed, forage, fiber, and oilseed crops. It has a soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when it is treated and managed using acceptable farming methods. Compared to other farmland, prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in less damage to the environment than farming other land.

Prime farmland may now be in crops, pasture, woodland, or similar uses, but it cannot be urban and built-up land or water areas. It must either be producing food or fiber or be available for these uses.

Prime farmland usually receives an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperatures, an adequate growing season, and suitable acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope gradient is usually less than 6 percent. For more detailed information on the criteria for prime farmland consult the local staff of the Soil Conservation Service.

Nearly 95 percent of Knox County, or about 317,000 acres, meets the requirements for prime farmland. It is throughout the county, mostly in map units 1, 2, 3, 4, 6, and 7 of the general soil map. Nearly all of it is used for corn and soybeans.

The prime farmland in some parts of the county has been used for industrial and urban uses. Such loss of prime farmland to nonfarm uses increases farming on marginal lands that generally are more erodible, droughty, and difficult to cultivate, and are usually less productive.

The detailed soil map units that make up the prime farmland in Knox County are listed in this section. This list, however, is not a recommendation for a particular land use.

Soils that have limitations such as a high water table, flooding, or inadequate rainfall may qualify as prime farmland if these limitations are overcome by drainage, flood control, irrigation, or other measures. In the following list, these requirements, where applicable, are in parenthesis. Onsite evaluation is necessary to see if these measures are effective.

The map units that meet the soil requirements for prime farmland are:

AlA—Alford silt loam, 0 to 2 percent slopes
AlB2—Alford silt loam, 2 to 6 percent slopes, eroded
AnB—Alvin fine sandy loam, 2 to 6 percent slopes
Ar—Armiesburg silty clay loam, rarely flooded
Ay—Ayrshire fine sandy loam (where drained)
Bd—Birds silt loam (where drained)
CoA—Conotton sandy loam, 0 to 3 percent slopes
EkA—Elkinsville silt loam, 0 to 2 percent slopes
ElA—Elston sandy loam, 0 to 3 percent slopes
Ha—Haymond silt loam, frequently flooded (where protected from flooding)
Hb—Haymond silt loam, rarely flooded
Hc—Haymond Variant loamy sand, frequently flooded (where protected from flooding)
HeA—Henshaw silt loam, 0 to 2 percent slopes (where drained)
HoA—Hosmer silt loam, 0 to 2 percent slopes
HoB2—Hosmer silt loam, 2 to 6 percent slopes, eroded
IoA—Iona silt loam, 0 to 2 percent slopes
IvA—Iva silt loam, 0 to 2 percent slopes (where drained)
Kn—Kings silty clay (where drained)
Lo—Lomax loam
Ly—Lyles fine sandy loam (where drained)
MbB2—Markland silt loam, 2 to 6 percent slopes, eroded
McA—McGary silt loam, 0 to 2 percent slopes (where drained)
No—Nolin silty clay loam, rarely flooded
Pb—Patton silt loam (where drained)
Pg—Peoga Variant silt loam (where drained)
Po—Petrolia silty clay loam, frequently flooded (where drained and protected from flooding)
PsA—Proctor silt loam, 0 to 2 percent slopes
Ra—Ragsdale silt loam (where drained)
ReA—Reesville silt loam, 0 to 2 percent slopes (where drained)
Sa—Selma loam (where drained)
Sc—Selma clay loam (where drained)
SdA—Stockland sandy loam, 0 to 2 percent slopes
SyB2—Sylvan silt loam, 2 to 6 percent slopes, eroded
Vn—Vincennes loam (where drained)
Vo—Vincennes clay loam, gravelly substratum (where drained)

Wa—Wakeland silt loam, frequently flooded (where drained and protected from flooding)
Wb—Wallkill silt loam (where drained and protected from flooding)
Wc—Wallkill silt loam, clayey substratum (where drained)
Zp—Zipp silty clay (where drained)
Zt—Zipp silty clay, frequently flooded (where drained and protected from flooding)

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Marion Mason, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Soil maps for detailed planning." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 267,369 acres in Knox County was used for crops and pasture in 1967, according to the Conservation Needs Inventory (*4*). Of this total, 24,500 acres was in permanent pasture; 157,827 acres in row crops, mainly corn and soybeans; 41,000 acres in close-grown crops, mainly wheat and oats; 17,518 acres in rotation hay and pasture; and the rest was idle cropland and used for other purposes.

The potential of the soils in Knox County for increased production of food is good. Food production could be increased considerably by irrigating and extending the latest crop production technology to all cropland in the county.

Drainage is the major soil problem on about 25 percent of the cropland and pasture. Most of the poorly drained and very poorly drained soils such as Birds soils, Patton soils, and Selma soils are satisfactorily drained for agricultural uses. A few depressional areas of these soils cannot be economically drained, however, because drainage ditches would have to be deep and extend for great distances to a suitable outlet.

Unless artificially drained, the somewhat poorly drained soils are so wet that crops are damaged during most years. These are the Iva soils, Ayrshire soils, and Wakeland soils, which together make up about 20,000 acres.

Hosmer soils have good natural drainage most of the year, but they tend to dry out slowly after rains. Small areas of wetter soils along drainageways and in swales are commonly included in areas of these soils, especially where slopes are 2 to 6 percent. Artificial drainage is needed in some of these wetter areas.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and tile drainage is needed in most areas of the very poorly drained soils that are used for intensive row cropping. Drains have to be more closely spaced in slowly permeable soils than in soils that are more permeable. Tile drainage is very slow in Zipp soils. Finding adequate outlets for tile drainage is difficult in many areas of Patton soils and Birds soils. Information on drainage design for each kind of soil is contained in the Technical Guide at local offices of the Soil Conservation Service.

Erosion is the major soil problem on about 52 percent of the cropland and pasture in Knox County. Where the slope is more than 2 percent, erosion is a hazard.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. This is especially damaging on soils that have a clayey subsoil, such as the Markland soils, and on soils that have a layer in or below the subsoil that limits the depth of the root zone, such as the fragipan in Hosmer soils. Second, soil erosion pollutes streams and decreases water quality for municipal use, for recreation, and for fish and wildlife.

In many sloping fields, preparing a good seedbed and tilling are difficult on clayey or hardpan spots because the original friable surface soil has been eroded away. Such spots are common in areas of moderately eroded Hosmer soils and Markland soils.

Erosion control practices provide surface cover, reduce runoff, and increase infiltration. A cropping system that keeps plant cover on the soil for extended periods can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils. On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping land and also provide nitrogen and improve tilth for the following crop.

Conservation tillage and leaving crop residues on the surface help to increase infiltration and reduce the hazards of runoff and erosion. These practices can be adapted to most soils in the survey area but are more difficult to use successfully on the eroded soils and on the soils that have a clayey surface layer, such as Patton soils and Zipp soils. No tillage for corn, which is increasingly common, reduces erosion on sloping land and can be adapted to most soils in the county.

Diversions and parallel tile outlet terraces are used to shorten slopes and reduce sheet, rill, and gulley erosion. They are most practical on deep, well drained soils that are highly susceptible to erosion. The benefits of terracing include a reduction in the loss of soil and fertilizer elements; a reduction in sediment problems such as crop damage and damage to watercourses; a reduction in the need for grassed waterways that take productive land out of row crops; a reduction in the use of fuel because it's easier to farm on the contour; and a reduction in the amount of pesticides entering water supplies. Many of the Alford soils, Hosmer soils, and Sylvan soils are suitable for terraces.

Grassed waterways are needed in many areas of sloping soils such as Alford soils, Hosmer soils, and Sylvan soils. Reesville soils and Ragsdale soils should also have grassed waterways in the many areas of these soils drained by a large watershed. Tile drainage is usually needed below the waterways to control seep water and improve conditions for a good vegetative cover.

Because there are a large number of open ditches in the county, many grade stabilization structures (fig. 14) are needed. These structures reduce erosion where surface water drains into an open ditch. They are also often needed to outlet grassed waterways, tile drainage, and gradient terraces.

Soil blowing is a hazard on Bloomfield soils and Ade soils. Soil blowing can damage these soils in a few hours if winds are strong and the soils are bare of vegetation or surface mulch. Maintaining vegetative cover, surface mulch, or rough surfaces through proper tillage minimizes soil blowing damage on these soils. Windbreaks of adapted shrubs are also effective. Soils that are plowed in the fall and left bare over winter are very susceptible to soil blowing the following spring.

Fertility is naturally low or moderate in most soils of the uplands and terraces in the survey area, and these soils are naturally strongly acid or medium acid. The soils on flood plains, such as Haymond soils, Armiesburg soils, and Wakeland soils, are neutral in acidity and are higher in plant nutrients than most upland and terrace soils. The poorly drained soils, such as Ragsdale soils, Patton soils, and Selma soils, are in slight depressions and receive runoff from adjacent upland soils. They normally are slightly acid or neutral.

Most upland and terrace soils require applications of ground limestone to raise the pH level for good growth of alfalfa and other crops that grow best on nearly neutral soils. Available phosphorus and potash levels are naturally low in most of these soils. Any addition of lime or fertilizer, however, should be based on soil tests, the need of the crop, and the desired level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of lime and fertilizer to apply.

Tilth is important in the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous.

Some of the soils used for crops in Knox County have a silt loam surface layer that is light in color and moderate in content of organic matter. Generally the structure of these soils is moderate to weak, and intense rainfall causes some crusting on the surface. The crust in some areas is hard when dry, and impervious to water. Once a hard crust forms, infiltration is reduced and runoff is increased. Regular additions of crop residues, manure, and other organic material can help improve soil structure and reduce crust formation.

Fall plowing is generally not a good practice on the light-colored soils that have a silt loam surface layer because a crust forms during the winter and spring. If plowed in fall, many of the soils are nearly as dense and hard at planting time in the spring as they were before fall plowing. Also, about 18 percent of the cropland consists of sloping soils that are subject to damaging erosion if they are plowed in the fall.

Figure 14.—Grade stabilization structure constructed in waterway helps reduce erosion on Alford soils by controlling speed of runoff.

The Zipp soils and Kings soils are clayey and tilth is a problem because the soils often stay wet until late in the spring. If plowed when wet, these soils tend to be very cloddy when dry and good seedbeds are difficult to prepare. Fall plowing these soils generally results in good tilth in the spring.

Field crops suited to the soils and climate of Knox County include many that are not now commonly grown. Corn and soybeans are the main row crops. Wheat and barley are the common close-growing crops. Rye could be grown, and seed could be produced from fescue, redtop, bluegrass, and red clover.

Special crops are of moderate commercial importance in the survey area. Only a moderate acreage is now used for vegetables and small fruits. Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruits. In the survey area these are the Elston soils, Conotton soils, and Stockland soils on slopes of less than 3 percent, and they total about 16,700 acres. These soils are underlain by water-bearing strata that provide an adequate source of water for irrigation. Many areas are irrigated and used for green beans, potatoes, and tomatoes. Many areas of Bloomfield soils and Alvin soils are used for melons. Crops can generally be planted and harvested earlier on all these soils than on the other soils in the survey area.

Most of the well drained soils in the county are suitable for orchards and nursery plants. Soils in low positions where frost is frequent and air drainage is poor, however, generally are poorly suited to early vegetables, small fruits, and orchards.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have few limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, soybeans, wheat, oats, and sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy lovegrass, bromegrass, bluegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, ragweed, polkweed, sheep sorrel, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, beech, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, pondweed, spikerush, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, dove, meadowlark, field sparrow, cottontail, red fox, and woodcock.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, rails, kingfishers, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 13 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface.

Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 19.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 17, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, or runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

engineering index test data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and their morphology." The soil samples were tested by the Indiana State Highway Research and Training Center, Purdue University.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

Some of the tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); and Plasticity index—T 90 (AASHTO), D 424 (ASTM).

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*11*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 20, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sols*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning moist, plus *alf*, from Alfisols).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*10*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*11*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Ade series

The Ade series consists of somewhat excessively drained, rapidly permeable soils on uplands and terraces. The soils formed in wind and water-deposited sand. Slope ranges from 2 to 6 percent. In Knox County, these soils are taxadjuncts to the Ade series because they have a loamy fine sand B2t horizon. This difference, however, does not affect use and management for most common purposes.

Ade soils are similar to Bloomfield soils and Chelsea soils and are commonly adjacent to Elston soils and Stockland soils in the landscape. Bloomfield and

Chelsea soils have a lighter colored surface layer than Ade soils. Chelsea soils do not have an argillic horizon. Elston soils have more clay in the B horizon, and Stockland soils formed in gravelly material.

Typical pedon of Ade loamy fine sand, 2 to 6 percent slopes, in a cultivated field, 100 feet south and 2,530 feet east of the northwest corner of sec. 13, T. 5 N., R. 10 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) loamy fine sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

A12—10 to 17 inches; very dark grayish brown (10YR 3/2) loamy fine sand, dark grayish brown (10YR 4/2) dry; weak medium granular structure; very friable; common fine roots; neutral; clear smooth boundary.

A2—17 to 32 inches; brown (10YR 5/3) fine sand; single grain; loose; few fine roots; medium acid; clear wavy boundary.

A&B—32 to 65 inches; yellowish brown (10YR 5/4) fine sand (A); single grain; loose; and bands of brown (7.5YR 4/4) loamy fine sand (B2t); weak medium subangular blocky structure; friable; bands are 1/4 inch to 2 inches thick, 4 to 7 inches apart, and have a cumulative total thickness of 9 inches; clay bridges connect sand grains in bands; medium acid; abrupt wavy boundary.

C—65 to 70 inches; pale brown (10YR 6/3) fine sand; single grain; loose; neutral.

The solum is 54 to 70 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The A12 horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. The A part of the A&B horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. The B part of the A&B horizon has hue of 7.5YR and value and chroma of 3 or 4. The B bands are 1/4 inch to 3 inches thick, 2 to 10 inches apart, and have a cumulative thickness of 6 to 15 inches. The uppermost bands are at a depth of 30 to 42 inches. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. It is slightly acid to mildly alkaline.

Alford series

The Alford series consists of well drained, moderately permeable soils on loess-capped uplands. The soils formed in loess. Slopes range from 0 to 18 percent.

Alford soils are similar to Hosmer soils and Sylvan soils and are adjacent to Iona soils in the landscape. Hosmer soils have a fragipan, and Sylvan soils have a thinner solum than the Alford soils and are calcareous in the substratum. Iona soils have mottles in the lower solum and are on slightly lower flats.

Typical pedon of Alford silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 2,200 feet southwest of the north corner and then 1,200 feet southeast of the northwest boundary of donation 162, T. 2 N., R. 9 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; weak medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

B1—6 to 9 inches; brown (7.5YR 5/4) silt loam; weak medium subangular blocky structure; friable; few fine roots; medium acid; clear smooth boundary.

B21t—9 to 22 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—22 to 32 inches; brown (7.5YR 4/4) silty clay loam; moderate coarse subangular blocky structure; firm; few fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; common medium black (10YR 2/1) iron and manganese oxide concretions; strongly acid; clear wavy boundary.

B31t—32 to 72 inches; brown (7.5YR 4/4) silt loam; weak coarse subangular blocky structure; friable; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; medium acid; gradual wavy boundary.

The solum is 60 to more than 80 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B1 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is medium acid or strongly acid. The B3 horizon is dominantly silt loam.

Alvin series

The Alvin series consists of well drained, moderately permeable soils on uplands. The soils formed in sandy and loamy wind deposits. Slope ranges from 2 to 18 percent.

Alvin soils are similar to Bloomfield soils and are commonly adjacent to Ayrshire soils and Lyles soils in the landscape. Bloomfield soils have a coarser solum than Alvin soils. Ayrshire soils are somewhat poorly drained and are on lower positions adjacent to small drainageways. Lyles soils are very poorly drained and are in depressions.

Typical pedon of Alvin fine sandy loam, 2 to 6 percent slopes, in a cultivated field, 300 feet west and 600 feet north of T road, donation 35, T. 3 N., R. 10 W.

Ap—0 to 8 inches; brown (10YR 4/3) fine sandy loam, yellowish brown (10YR 5/4) dry; weak medium granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

B1t—8 to 16 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; few fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

B21t—16 to 31 inches; strong brown (7.5YR 5/6) sandy loam; moderate medium subangular blocky structure; friable; few fine roots; thin continuous dark brown (7.5YR 4/4) clay films and very pale brown (10YR 7/3) silt coatings on faces of peds; slightly acid; clear smooth boundary.

B22t—31 to 40 inches; strong brown (7.5YR 5/6) sandy loam; weak coarse subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; gradual wavy boundary.

B3—40 to 54 inches; dark brown (7.5YR 4/4) fine sandy loam with bands of loamy fine sand; weak very coarse subangular blocky structure; very friable; medium acid; gradual wavy boundary.

C—54 to 60 inches; dark yellowish brown (10YR 4/4) loamy sand with bands of fine sandy loam; single grain; loose; slightly acid.

The solum is 42 to 60 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6. It is sandy loam, fine sandy loam, or sandy clay loam and is medium acid or slightly acid. The C horizon is loamy sand or fine sandy loam and is commonly stratified with fine sand or coarse silt. It is slightly acid to moderately alkaline.

Armiesburg series

The Armiesburg series consists of well drained, moderately permeable soils on broad bottom lands. The soils formed in silty alluvial sediment. Slope ranges from 0 to 2 percent.

Armiesburg soils are similar to Nolin soils and are commonly adjacent to them in the landscape. Nolin soils have a lighter colored surface layer than Armiesburg soils.

Typical pedon of Armiesburg silty clay loam, rarely flooded, in a cultivated field, 2,800 feet south and 50 feet west in the northeast corner of sec. 28, T. 5 N., R. 7 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A12—8 to 16 inches; very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; moderate medium angular blocky structure; firm; many fine roots; neutral; clear wavy boundary.

B21—16 to 24 inches; dark brown (10YR 4/3) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; many fine roots; very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear wavy boundary.

B22—24 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; common fine roots; dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) organic coatings on faces of peds; neutral; gradual wavy boundary.

C—38 to 60 inches; brown (10YR 5/3) silty clay loam; common distinct light brownish gray (10YR 6/2) and dark yellowish brown (10YR 4/4) mottles; massive; firm; few fine roots; neutral.

The solum is 32 to 45 inches thick. The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3. It ranges from 10 to 20 inches in thickness. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Some pedons are mottled below a depth of 24 inches, and some pedons contain thin strata of silt loam and fine sandy loam below a depth of 50 inches.

Ayrshire series

The Ayrshire series consists of somewhat poorly drained, moderately slowly permeable soils on uplands. The soils formed in sandy and loamy wind deposits. Slope ranges from 0 to 2 percent.

Ayrshire soils are similar to Iva soils and are commonly adjacent to Bloomfield soils, Lyles soils, and Alvin soils in the landscape. The Iva soils contain finer material in the solum than Ayrshire soils. Bloomfield soils and Alvin soils have brown subsoils and occupy higher positions in the landscape. Lyles soils have a darker surface layer and are on lower positions in the landscape.

Typical pedon of Ayrshire fine sandy loam, in a cultivated field, 200 feet northeast of the south corner and then 200 feet northwest of the southeast boundary of donation 220, T. 5 N., R. 9 W.

Ap—0 to 7 inches; brown (10YR 5/3) fine sandy loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A2—7 to 9 inches; grayish brown (10YR 5/2) fine sandy loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure; friable; many fine roots; neutral; clear smooth boundary.

B1—9 to 16 inches; brown (10YR 5/3) loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; many fine roots; medium acid; clear smooth boundary.

B21tg—16 to 21 inches; grayish brown (10YR 5/2) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; many fine roots; thin continuous gray

(10YR 5/1) clay films on faces of peds; few small black (10YR 2/1) iron and manganese oxide concretions; medium acid; clear smooth boundary.

B22tg—21 to 32 inches; gray (10YR 6/1) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; common fine roots; thick continuous gray (10YR 5/1) clay films on faces of peds; few small black (10YR 2/1) iron and manganese oxide concretions; medium acid; clear smooth boundary.

B23tg—32 to 45 inches; gray (10YR 5/1) sandy clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak very coarse subangular blocky structure; firm; few fine roots; thick continuous gray (10YR 5/1) clay films on faces of peds; slightly acid; clear smooth boundary.

B3g—45 to 55 inches; grayish brown (10YR 5/2) sandy loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; slightly acid; clear smooth boundary.

Cg—55 to 60 inches; light brownish gray (10YR 6/2) loamy sand with strata of silt; few fine distinct yellowish brown (10YR 5/6) mottles; single grain and massive; very friable and friable; moderate effervescence; mildly alkaline.

The solum is 45 to 60 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is fine sandy loam or loam. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 6. Mottles are common or many. It ranges from loam to clay loam in the upper part to sandy clay loam or sandy loam in the lower part. It ranges from slightly acid to strongly acid. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 6. It is neutral or mildly alkaline.

Birds series

The Birds series consists of poorly drained, moderately slowly permeable soils on bottom lands. The soils formed in silty alluvial sediment. Slope ranges from 0 to 2 percent.

Birds soils are similar to Petrolia soils and are commonly adjacent to Patton soils and Wakeland soils in the landscape. Petrolia soils contain more clay than do Birds soils. Patton soils contain more clay and have a darker surface layer. Wakeland soils have browner subhorizons and are on slightly higher areas.

Typical pedon of Birds silt loam, in a cultivated field, 2,100 feet southwest of the east corner and then 100 feet northwest of the southeast boundary of donation 178, T. 2 N., R. 9 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/1) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

C1g—7 to 31 inches; gray (10YR 5/1) silt loam; common medium distinct yellowish brown (10YR 5/6) and few fine faint gray (10YR 6/1) mottles; weak coarse granular structure; friable; few fine roots; neutral; clear smooth boundary.

C2g—31 to 60 inches; gray (10YR 5/1) silt loam with thin strata of silty clay loam; many medium distinct yellowish brown (10YR 5/6) and few fine faint gray (10YR 6/1) mottles; weak coarse subangular blocky structure; friable; neutral.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. It is typically silt loam to a depth of 40 inches but some individual layers are silty clay loam. It is medium acid to neutral. The underlying material below a depth of 40 inches is slightly acid or neutral.

Bloomfield series

The Bloomfield series consists of somewhat excessively drained, moderately rapidly permeable soils on uplands and terraces. The soils formed in windblown sand. Slope ranges from 2 to 18 percent. In Knox County, these soils are taxadjuncts to the Bloomfield series because of their sandiness. This difference, however, does not affect use and management for most common purposes.

Bloomfield soils are similar to Ade soils and Chelsea soils and are commonly adjacent to Ayrshire soils and Alvin soils in the landscape. Ade soils have a darker surface layer than Bloomfield soils. Chelsea soils do not have an argillic horizon. Ayrshire soils have a gray mottled solum and occupy lower positions in the landscape. Alvin soils have a thicker continuous argillic horizon.

Typical pedon of Bloomfield loamy fine sand, 2 to 10 percent slopes, in a cultivated field, 600 feet northeast of the south corner and then 100 feet northwest of the southeast boundary of donation 207, T. 4 N., R. 9 W.

Ap—0 to 9 inches; brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; weak medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A2—9 to 30 inches; brown (10YR 5/3) loamy sand; weak coarse subangular blocky structure; friable; few fine roots; slightly acid; abrupt wavy boundary.

A&B—30 to 55 inches; yellowish brown (10YR 5/4) sand (A2); weak medium subangular blocky structure; friable; with wavy discontinuous bands of dark brown (7.5YR 4/4) loamy sand (B2t); weak medium subangular blocky structure; firm; bands are 1/4 to 1/2 inch thick and 3 or 4 inches apart in the upper part of the horizon, 1/2 to 1 inch thick and 3 or 4 inches apart in the lower part of the horizon; slightly acid; clear wavy boundary.

B&A—55 to 80 inches; dark brown (7.5YR 4/4) loamy sand (B2t); weak medium subangular blocky structure; firm; continuous bands 1 to 5 inches thick and 1 1/2 to 4 1/2 inches apart of yellowish brown (10YR 5/4) loamy sand (A2); weak medium subangular blocky structure; friable; slightly acid; clear wavy boundary.

The solum is 55 to more than 80 inches thick. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is loamy fine sand or fine sand. The A2 has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loamy fine sand or fine sand. The A2 part of the A&B horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. It is fine sand, sand, or loamy sand. The B2t bands are 1/8 inch to 4 inches thick. The cumulative thickness of the bands above a depth of 60 inches ranges from 6 inches to more than 10 inches. They have hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 3 or 4. Texture of the bands is loamy sand or sandy loam. Reaction is strongly acid or slightly acid. The thickness of the A2 material between the banded B2t material ranges from 2 to 12 inches.

Chelsea series

The Chelsea series consists of excessively drained, rapidly permeable soils on uplands and terraces. The soils formed in windblown sand. Slope ranges from 4 to 10 percent.

Chelsea soils are similar to Ade soils and Bloomfield soils and are commonly adjacent to Conotton soils in the landscape. Ade and Bloomfield soils have banded argillic horizons and Ade soils have a darker surface layer than Chelsea soils.

The Conotton soils have a continuous argillic horizon and are developed in coarser materials.

Typical pedon of Chelsea loamy fine sand, 4 to 10 percent slopes, in a cultivated field, 600 feet east and 1,270 feet north of the southwest corner of sec. 22, T. 2 N., R. 11 W.

Ap—0 to 10 inches, brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

A21—10 to 20 inches; dark yellowish brown (10YR 4/4) fine sand; single grain; loose; common fine roots; slightly acid; gradual smooth boundary.

A22—20 to 42 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; few fine roots; medium acid; gradual wavy boundary.

A&B—42 to 80 inches; light yellowish brown (10YR 6/4) fine sand (A2); single grain; loose; discontinuous bands of brown (7.5YR 4/4) loamy fine sand (B2t) that are 1/8 inch to 1 1/2 inches apart; very weak medium subangular blocky structure; friable; strongly acid.

The solum is 60 to more than 80 inches thick. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. It is loamy fine sand or fine sand. The A2 horizon has hue of 10YR, value of 5, and chroma of 4 to 6. It is loamy sand or fine sand. The B part of the A & B horizon has 7.5YR hue and value and chroma of 3 or 4 and is loamy fine sand or sandy loam. The depth to the uppermost lamellae ranges from 36 to 45 inches. Total thickness of the lamellae to a depth of 60 inches is 2 to 6 inches. The A part of the A & B horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4.

Chetwynd series

The Chetwynd series consists of well drained, moderately permeable soils on uplands. The soils formed in loamy glacial outwash. Slope ranges from 25 to 50 percent.

Chetwynd soils are commonly adjacent to Alford soils. Alford soils contain less sand in the solum than do Chetwynd soils and are on less steeply sloping positions in the landscape.

Typical pedon of Chetwynd loam, 25 to 50 percent slopes, in a wooded area, 990 feet northwest of the south corner and then 1,650 feet northeast of the southwest boundary of donation 63, T. 3 N., R. 9 W.

A1—0 to 3 inches; dark grayish brown (10YR 3/2) loam, gray (10YR 5/1) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A2—3 to 6 inches; brown (10YR 5/3) loam; weak thick platy structure parting to moderate medium granular; friable; many fine roots; medium acid; clear smooth boundary.

B1—6 to 12 inches; brown (7.5YR 4/4) sandy clay loam; weak fine subangular blocky structure; firm; many fine roots; strongly acid; clear smooth boundary.

B21t—12 to 22 inches; yellowish red (5YR 4/6) clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

B22t—22 to 45 inches; yellowish red (5YR 5/6) sandy clay loam; moderate coarse subangular blocky structure; firm; few fine roots; thin reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

B31t—45 to 76 inches; yellowish red (5YR 5/6) sandy clay loam; weak coarse subangular blocky structure; firm; thin reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

The solum is 65 to more than 80 inches thick. The A1 horizon has hue of 10YR, value of 3, and chroma of 1. The A2 horizon has hue of 10YR, value of 5, and chroma of 3 or 4. The B1 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4. It is loam or sandy clay loam. The B2t horizon has hue of 5YR, value of 4 or 5, and chroma of 4 to 6. It is sandy clay loam or clay loam and very strongly acid or strongly acid.

Conotton series

The Conotton series consists of well drained, rapidly permeable soils on outwash plains. The soils formed in loamy and sandy glacial outwash that contains a large amount of gravel. Slope ranges from 0 to 3 percent. In Knox County, these soils are less acid in the B2t horizon than the defined range for the Conotton series. This difference, however, does not affect use and management for most common purposes.

Conotton soils are similar to Stockland soils and are commonly adjacent to Selma soils in the landscape. Stockland soils have a darker surface layer than Conotton soils and do not have an argillic horizon. Selma soils have a mottled gray and brown subsoil, contain less gravel in the solum, and are on lower, slightly depressed areas in the landscape.

Typical pedon of Conotton sandy loam, 0 to 3 percent slopes, in a cultivated field, 200 feet south and 1,200 feet west of the junction of old Highway 41 and Brokhage Road, Vincennes Commons, donation 34, T. 2 N., R. 10 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) sandy loam, light yellowish brown (10YR 6/4) dry; weak medium granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

B1t—10 to 15 inches; dark brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; many fine roots; few discontinuous dark brown (7.5YR 3/4) clay films on faces of peds and bridging across sand grains; medium acid; clear smooth boundary.

B21t—15 to 26 inches; dark brown (7.5YR 4/4) very gravelly sandy clay loam; weak medium subangular blocky structure; firm; common fine roots; few thick discontinuous dark brown (7.5YR 3/4) clay films on faces of peds and bridging across sand grains; 57 percent gravel; slightly acid; clear wavy boundary.

B22t—26 to 39 inches; reddish brown (5YR 4/4) gravelly sandy clay loam; moderate coarse subangular blocky structure; firm; few fine roots; few thin discontinuous reddish brown (5YR 3/3) clay films on faces of peds and bridging across sand grains; 40 percent gravel; slightly acid; gradual wavy boundary.

B3—39 to 52 inches; dark brown (7.5YR 4/4) gravelly sandy loam; weak very coarse subangular blocky structure; firm; 38 percent gravel; neutral; abrupt irregular boundary.

C—52 to 60 inches; brown (10YR 5/3) very gravelly sand; single grain; loose; 54 percent gravel; strong effervescence; moderately alkaline.

The solum is 48 to 65 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The B2t horizon has hue of 7.5YR, 5YR, or 10YR; value of 3 to 5; and chroma of 4 to 6. It is very gravelly sandy clay loam with some individual horizons of gravelly or very gravelly sandy loam. The gravel content of the B2t horizon ranges from 35 to 60 percent by volume. Reaction is medium acid or slightly acid. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is very gravelly sand or gravel and sand. Reaction is neutral or moderately alkaline.

Edwards Variant

Edwards Variant consists of very poorly drained, moderately slowly permeable soils. The soils are in depressions on nearly level outwash terraces. They formed in organic deposits, marl, and underlying sandy outwash.

Edwards Variant soils are commonly adjacent to Lyles soils and Selma soils in the landscape. The Lyles soils and Selma soils formed mostly from mineral deposits and do not have a thick organic surface layer.

Typical pedon of Edwards Variant muck, drained, in a cultivated field, 200 feet south and 100 feet west of the northeast corner of donation 9, T. 2 N., R. 10 W.

Oap—0 to 9 inches; black (N 2/0) rubbed sapric material, less than 5 percent fibers rubbed; moderate medium granular structure; friable; medium acid; abrupt smooth boundary.

Oa2—9 to 13 inches; black (N 2/0) rubbed sapric material; about 10 percent fibers, less than 5 percent rubbed; weak medium subangular blocky structure; friable; slightly acid; clear wavy boundary.

Oa3—13 to 20 inches; dark brown (7.5YR 3/2) rubbed sapric material; about 15 percent fibers, 5 percent rubbed; few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; medium acid; gradual wavy boundary.

Lcal—20 to 23 inches; gray (10YR 5/1) marl; massive; about 5 percent gravel; strong effervescence; moderately alkaline; abrupt smooth boundary.

Lca2—23 to 28 inches; gray (10YR 6/1) marl; massive; about 10 percent gravel; strong effervescence; moderately alkaline; clear wavy boundary.

IIC—28 to 60 inches; mottled grayish brown (2.5YR 5/2) and gray (10YR 6/1) gravelly sand; single grain; loose; strong effervescence; moderately alkaline.

Depth to the sandy IIC material ranges from 16 to 35 inches. The organic part of the subsurface tier has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 to 3, or is N 2/0 or N 3/0. A few woody fragments ranging from 1/8 inch to 5 inches in diameter are mixed throughout the subsurface tiers in some pedons. The marl layer ranges from 2 to 10 inches in thickness but typically is 6 to 8 inches thick.

Elkinsville series

The Elkinsville series consists of well drained, moderately permeable soils on terraces. The soils formed in silty and loamy alluvium. Slope ranges from 0 to 2 percent. In Knox County, these soils have a lower base saturation than the Elkinsville series. This difference, however, does not affect use and management for most common purposes.

Elkinsville soils are similar to Sylvan soils and are commonly adjacent to Nolin soils and Vincennes soils in the landscape. Sylvan soils have a thinner solum than Elkinsville soils and are underlain with calcareous loess. The Nolin soils do not have an argillic horizon, and they occupy lower positions in the landscape. The Vincennes soils contain more sand, have a gray, mottled subsoil, and are in the lowest positions in the landscape.

Typical pedon of Elkinsville silt loam, 0 to 2 percent slopes, in a cultivated field, 1,980 feet south and 660 feet east of the northwest corner of sec. 11, T. 1 N., R. 10 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A2—8 to 15 inches; brown (10YR 5/3) silt loam; weak medium platy structure parting to weak medium granular; friable; many fine roots; neutral; clear smooth boundary.

B21t—15 to 33 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; many continuous distinct medium reddish brown (5YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—33 to 42 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium and coarse subangular blocky structure; firm; few fine roots; many continuous thin dark brown (7.5YR 4/4) clay films on faces of peds; few pale brown (10YR 6/3) silt coatings on faces of peds and crack fills; strongly acid; clear smooth boundary.

IIB23t—42 to 54 inches; strong brown (7.5YR 5/6) sandy clay loam; weak coarse subangular blocky structure; firm; few thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.

IIC—54 to 60 inches; yellowish brown (10YR 5/4) loam with strata of fine sandy loam; massive; friable; strongly acid.

The solum is 48 to 65 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. The IIB2t is sandy clay loam or clay loam. The IIC horizon has hue of 10YR, value of 5, and chroma of 3 to 6.

Elston series

The Elston series consists of well drained, moderately rapidly permeable soils on terraces. The soils formed in loamy outwash. Slope ranges from 0 to 3 percent. In Knox County, these soils do not have the argillic horizon that is defined for the Elston series. This difference, however, does not affect use and management for most common purposes.

The Elston soils are similar to Stockland soils and are commonly adjacent to Ade soils and Conotton soils. The Stockland soils formed in coarser outwash material than did the Elston soils. Ade soils are formed in windblown sand, and they have a discontinuous banded argillic horizon. Conotton soils do not have a mollic epipedon.

Typical pedon of Elston sandy loam, 0 to 3 percent slopes, in a cultivated field, 600 feet north and 30 feet west of the southeast corner of donation 12, T. 5 N., R. 10 W.

Ap—0 to 10 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

A12—10 to 19 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak coarse subangular blocky structure; friable; many fine roots; slightly acid; clear wavy boundary.

B21—19 to 32 inches; dark yellowish brown (10YR 4/4) sandy loam; weak coarse subangular blocky structure; friable; common fine roots; thin dark brown (7.5YR 3/2) clay films as bridging of sand grains; medium acid; clear wavy boundary.

B22—32 to 43 inches; dark brown (7.5YR 4/4) loamy sand; weak coarse subangular blocky structure; friable; common fine roots; thin dark brown (7.5YR 3/2) clay films as bridging of sand grains; medium acid; gradual wavy boundary.

B3—43 to 66 inches; dark brown (7.5YR 4/4) coarse sand; single grain; loose; medium acid; abrupt wavy boundary.

C—66 to 80 inches; pale brown (10YR 6/3) fine sand and sand; single grain; loose; strong effervescence; moderately alkaline.

The solum is 50 to 70 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The B2 horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4. It is sandy loam or loamy sand with some individual horizons of loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is loamy sand, fine sand, or sand and ranges from medium acid to moderately alkaline.

Fairpoint series

The Fairpoint series consists of well drained, moderately slowly permeable soils on uplands. The soils formed in a regolith left from surface mining operations. Slope ranges from 0 to 90 percent.

Fairpoint soils are on upland areas adjacent to Alford, Hosmer, Iona, Iva, and Sylvan soils. None of these adjacent soils formed in mine spoil.

Typical pedon of Fairpoint shaly silt loam, 0 to 8 percent slopes, in a pasture, 710 feet east and 1,070 feet north of the southwest corner of sec. 25, T. 5 N., R. 8 W.

A1—0 to 1 inch; brown (10YR 5/3) shaly silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; 15 percent, by volume, fragments of shale; 3 percent, by volume, fragments of sandstone; medium acid; abrupt smooth boundary.

C1—1 to 18 inches; yellowish brown (10YR 5/4) shaly silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; massive; friable; common fine roots; 30 percent, by volume, fragments of dark gray (10YR 4/1) shale; 10 percent, by volume, fragments of brown (10YR 5/3) sandstone; slightly acid; clear smooth boundary.

C2—18 to 30 inches; yellowish brown (10YR 5/4) shaly silty clay loam; massive; firm; 40 percent, by volume, fragments of gray (10YR 5/1) shale; 5 percent, by volume, fragments of brown (10YR 5/3) sandstone; 2 percent, by volume, fragments of coal; neutral; internal planes of shale fragments contain calcareous material; abrupt wavy boundary.

C3—30 to 60 inches; yellowish brown (10YR 5/4) very shaly silty clay loam; massive; common medium distinct light brownish gray (10YR 6/2) relict mottles; firm; 35 percent, by volume, fragments of gray (10YR 5/1) shale; 15 percent, by volume, fragments of brown (10YR 5/3) sandstone; 2 percent, by volume, fragments of coal.

The depth to bedrock is more than 5 feet. Reaction is medium acid to neutral. The percent of coarse fragments in the central section ranges from 35 to 60 percent. Coarse fragments range mostly from 2 mm to 25 cm in diameter but include stones and boulders. The A horizon is silt loam or shaly silt loam. The C horizons are shaly or very shaly phases of silt loam or silty clay loam.

Haymond series

The Haymond series consists of well drained, moderately permeable soils on bottom lands. The soils formed in silty and loamy alluvial sediment. Slope ranges from 0 to 2 percent.

Haymond soils are similar to Nolin soils and are commonly adjacent to Armiesburg soils and Petrolia soils in the landscape. Nolin soils contain more clay in the solum than Haymond soils. Armiesburg soils and Petrolia soils have a gray, mottled subsoil in the lower swales.

Typical pedon of Haymond silt loam, frequently flooded, in a cultivated field, 1,800 feet east and 300 feet north of the southwest corner of sec. 2, T. 1 S., R. 11 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

B21—10 to 25 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; thin continuous brown (10YR 4/3) coatings on faces of peds; slightly acid; clear smooth boundary.

B22—25 to 44 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) coatings on faces of peds; neutral; gradual smooth boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) fine sandy loam with strata of silt loam; massive; friable; neutral.

The solum is 36 to 50 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is slightly acid or neutral. The C horizon is stratified and ranges from fine sandy loam to silt loam. It is slightly acid or neutral.

Haymond Variant

Haymond Variant consists of well drained, moderately permeable soils on bottom lands. The soils formed in sandy and silty alluvial sediment. Slope ranges from 0 to 2 percent.

Haymond Variant soils are similar to Landes soils and are commonly adjacent to Haymond soils and Nolin soils in the landscape. Landes soils have a mollic epipedon. Haymond soils have a silt loam surface layer, and Nolin soils have more clay throughout the solum than do the Haymond Variant soils.

Typical pedon of Haymond Variant loamy sand, frequently flooded, in a cultivated field, 360 feet south and 340 feet east of the northwest corner of sec. 10, T. 1 S., R. 10 W.

Ap—0 to 8 inches; brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

A2—8 to 15 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium granular structure; very friable; many fine roots; neutral; clear smooth boundary.

B21—15 to 24 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

B22—24 to 38 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure;

friable; thin continuous brown (10YR 4/3) coatings on faces of peds; few fine roots; neutral; clear smooth boundary.

B3—38 to 44 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) coatings on faces of peds; neutral; gradual wavy boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) fine sandy loam with strata of loamy sand; massive; friable; neutral.

The solum is 40 to 60 inches thick. There are 12 to 19 inches of loamy sand on the surface. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Some pedons have thin layers of fine sandy loam in the lower part. Reaction is slightly acid or neutral. The C horizon is silt loam or fine sandy loam. Some pedons have strata of fine sand or loamy sand. Reaction is slightly acid or neutral.

Henshaw series

The Henshaw series consists of somewhat poorly drained, moderately slowly permeable soils on terraces. The soils formed in silty lacustrine sediment. Slope ranges from 0 to 2 percent.

Henshaw soils are similar to Reesville soils and are adjacent to Patton soils in the landscape. Reesville soils have a thinner solum than Henshaw soils. Patton soils, which are in the lower positions on the landscape, have a mollic epipedon and a grayer solum. They do not have an argillic horizon.

Typical pedon of Henshaw silt loam, 0 to 2 percent slopes, in a cultivated field, 1,320 feet northwest of the south corner and then 50 feet northeast of the southwest boundary of donation 128, T. 3 N., R. 8 W.

Ap—0 to 10 inches; brown (10YR 5/3) silt loam, light yellowish brown (10YR 6/4) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

B21t—10 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct pale brown (10YR 6/3) mottles; moderate medium angular blocky structure; firm; thin continuous pale brown (10YR 6/3) clay films on faces of peds; thin light brownish gray (10YR 6/2) silt coatings on faces of peds and in vertical crack fills; common fine roots; strongly acid; clear smooth boundary.

B22t—17 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; thin continuous grayish brown (2.5Y 5/2) clay films on faces of peds; common fine roots; medium acid; gradual smooth boundary.

B3t—28 to 49 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; few patchy gray (10YR 5/1) clay films on faces of peds; few fine roots; slightly acid; gradual smooth boundary.

C—49 to 60 inches; yellowish brown (10YR 5/6) and gray (10YR 6/1) silty clay loam with thin strata of silt loam; massive; firm; neutral.

The solum is 42 to 60 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 4 to 6. The B3 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6. It is slightly acid or neutral. The C horizon is silty clay loam or silt loam and is stratified. Reaction ranges from neutral to mildly alkaline.

Hickory series

The Hickory series consists of well drained, moderately permeable soils on uplands. The soils formed in loamy glacial till. Slope ranges from 25 to 50 percent.

Hickory soils are similar to Alford soils and Chetwynd soils. Alford soils are more silty than Hickory soils. Chetwynd soils are redder and contain more sand in the solum and substratum.

Typical pedon of Hickory loam, 25 to 50 percent slopes, in a wooded area, 1,980 feet southeast of the west corner and then 1,650 feet northeast of the southwest boundary of donation 95, T. 4 N., R. 9 W.

A1—0 to 3 inches, dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine and medium roots; medium acid; abrupt smooth boundary.

A2—3 to 5 inches; brown (10YR 5/3) loam; weak medium platy structure parting to weak fine subangular blocky; friable; many fine and medium roots; 5 percent fine gravel; medium acid; clear smooth boundary.

B1—5 to 12 inches; yellowish brown (10YR 5/4) loam; moderate fine subangular blocky structure; friable; many fine and medium roots; 5 percent fine gravel; medium acid; clear smooth boundary.

B21t—12 to 22 inches; brown (7.5YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous brown (10YR 5/3) clay films on faces of peds; 5 percent fine gravel; strongly acid; gradual smooth boundary.

B22t—22 to 34 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; common fine black (10YR 2/1) iron and manganese oxide accumulations; 10 percent fine gravel; strongly acid; gradual smooth boundary.

B3t—34 to 49 inches; yellowish brown (10YR 5/4) clay loam; few fine faint yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; few roots; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; common fine black (10YR 2/1) iron and manganese oxide accumulations; 10 percent fine gravel; few weathered sandstone fragments; medium acid; gradual smooth boundary.

C—49 to 80 inches; brown (10YR 5/3) clay loam; few fine faint yellowish brown (10YR 5/8) mottles; massive; firm; 10 percent fine gravel and few weathered sandstone fragments; slightly acid.

The solum is 45 to 72 inches thick. The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B1 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or loam. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and hue of 4 to 6. Mottles with chroma of 2 are in the B22 horizon in some pedons. In some pedons the upper part of the B2 horizon is silty clay loam. Reaction is medium acid or strongly acid. The C horizon is clay loam or loam and is slightly acid or neutral.

Hosmer series

The Hosmer series consists of well drained, very slowly permeable soils on uplands. The soils formed in silty loess that is more than 5 feet thick. Slope ranges from 0 to 18 percent.

Hosmer soils are similar to Alford soils and are commonly adjacent to Iva soils in the landscape. Alford soils and Iva soils do not have fragipans, and Iva soils are at the heads of small drainageways and have a gray, mottled subsoil.

Typical pedon of Hosmer silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 1,340 feet east and 435 feet south of the northwest corner of donation 68, T. 3 N., R. 9 W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B1—6 to 13 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; common fine roots; medium acid; clear smooth boundary.

B21t—13 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

B22t—21 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; many pale brown (10YR 6/3) and common light brownish gray (10YR 6/2) silt coatings in crack fills and on vertical faces of peds; few black (10YR 2/1) iron and manganese oxide stains; very strongly acid; clear wavy boundary.

B&A—28 to 30 inches; yellowish brown (10YR 5/6) silt loam (B2t); weak coarse prismatic structure that parts to moderate medium subangular blocky; firm; few fine roots; many fine vesicular pores; thin to thick coatings and fillings of light brownish gray (10YR 6/2) and light gray (10YR 7/1) silt (A2); very strongly acid; abrupt irregular boundary.

Bx1—30 to 45 inches; yellowish brown (10YR 5/6) silt loam; strong very coarse prismatic structure; very firm and brittle; few fine flattened roots between prisms; thick continuous brown (7.5YR 4/4) clay films on faces of peds; thin continuous light brownish gray (10YR 6/2) silt coatings in pores, on faces of peds, and in vertical crack fills; very strongly acid; gradual wavy boundary.

Bx2—45 to 64 inches; yellowish brown (10YR 5/6) silt loam; strong very coarse prismatic structure; very firm and brittle; many fine vesicular pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; thick light brownish gray (10YR 6/2) silt coatings in vertical crack fills between prisms; very strongly acid; gradual irregular boundary.

C—64 to 80 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; thick gray (10YR 5/1) clay films and light brownish gray (10YR 6/2) silt coatings along vertical cracks; strongly acid.

The solum is 55 to more than 80 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. Reaction is strongly acid or very strongly acid. The Bx horizon is 24 to 48 inches thick. It has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It has a strong coarse or very coarse prismatic structure. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam.

Iona series

The Iona series consists of moderately well drained, moderately slowly permeable soils on uplands. The soils formed in silty calcareous loess. Slope ranges from 0 to 2 percent.

Iona soils are similar to Sylvan soils and are commonly adjacent to Ragsdale soils and Reesville soils. Sylvan soils do not have gray mottles in the lower part of the subsoil. Ragsdale soils have a mollic epipedon and a gray, mottled subsoil and are in concave positions. Reesville soils have a grayer subsoil than Iona soils and are on broad flats.

Typical pedon of Iona silt loam, 0 to 2 percent slopes, in a cultivated field, 1,350 feet southwest of the east corner and then 200 feet northwest of the southeast boundary of donation 180, T. 4 N., R. 9 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

B21t—10 to 23 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous brown (10YR 5/3) clay films on faces of peds; light gray (10YR 7/2) silt coatings in voids and on faces of peds; strongly acid; clear wavy boundary.

B22t—23 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium and coarse subangular blocky structure; firm; few and common fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide concretions; medium acid; clear wavy boundary.

B3t—32 to 45 inches; light yellowish brown (10YR 6/4) silt loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; thin dark grayish brown (10YR 4/2) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide concretions; neutral; gradual wavy boundary.

C—45 to 60 inches; light yellowish brown (10YR 6/4) silt loam; common coarse distinct light brownish gray (10YR 6/2) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 40 to 50 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. An A2 horizon 3 to 6 inches thick is present in some pedons. The B2t horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is silt loam or silty clay loam and is strongly acid or medium acid. The B3 horizon ranges from slightly acid to mildly alkaline.

Iva series

The Iva series consists of somewhat poorly drained, slowly permeable soils on uplands. The soils formed in silty loess. Slope ranges from 0 to 2 percent.

Iva soils are similar to Reesville soils and are commonly adjacent to Alford soils and Hosmer soils. The Reesville soils have a thinner solum than the Iva soils and are calcareous in the lower part. Alford soils are on higher positions and have a brown subsoil that is free of mottles. Hosmer soils have a fragipan and are on higher positions.

Typical pedon of Iva silt loam, 0 to 2 percent slopes, in a cultivated field, 1,330 feet west and 1,360 feet south of the northeast corner of sec. 23, T. 5 N., R. 8 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A2—8 to 12 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; weak thick platy structure; friable; many fine roots; strongly acid; clear wavy boundary.

B1—12 to 15 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; friable; common fine roots; many light gray (10YR 7/2) silt coatings on faces of peds; strongly acid; clear wavy boundary.

B21t—15 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; continuous grayish brown (10YR 5/2) clay films on faces of peds; thin light gray (10YR 7/2) silt coatings on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

B22t—30 to 41 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; thin dark grayish brown (10YR 5/2) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; medium acid; gradual wavy boundary.

B3t—41 to 54 inches; yellowish brown (10YR 5/4) silt loam; many coarse distinct light brownish gray (10YR 6/2) mottles; weak subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 5/2) clay films on faces of peds; few thin light gray (10YR 7/2) silt coatings along vertical faces of peds; few thin black (10YR 2/1) iron and manganese oxide accumulations; slightly acid; clear wavy boundary.

C—54 to 60 inches; mottled yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) silt loam; massive; friable; few thin black (10YR 2/1) iron and manganese oxide accumulations; slightly acid.

The solum is 48 to 60 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The B2t horizon has hue of 10YR, value of 5, and chroma of 3 to 6. Reaction ranges from very strongly acid to medium acid. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 6.

Kings series

The Kings series consists of very poorly drained, very slowly permeable soils on lacustrine terraces. The soils formed in calcareous clayey lacustrine sediments. Slope ranges from 0 to 1 percent.

Kings soils are similar to Patton soils and adjacent to Birds soils and Zipp soils in the landscape. Patton soils have less clay in the surface layer and subsoil than do the Kings soils. Birds soils have a lighter colored surface layer and have less clay throughout the profile. Zipp soils have a lighter colored surface layer and are on broad flats and narrow sloughs.

Typical pedon of Kings silty clay, in a cultivated field, 90 feet east and 1,225 feet south of the northwest corner of sec. 18, T. 5 N., R. 7 W.

Ap—0 to 6 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; weak fine granular structure; firm; many fine roots; neutral; abrupt smooth boundary.

A12—6 to 14 inches; very dark gray (N 3/0) silty clay, dark gray (10YR 4/1) dry; few fine distinct dark brown (10YR 4/3) mottles; moderate fine angular blocky structure; firm; many fine roots; neutral; clear smooth boundary.

B21g—14 to 20 inches; dark gray (N 4/0) silty clay; few medium distinct olive brown (2.5Y 4/4) and dark brown (7.5YR 4/4) mottles; moderate coarse angular blocky structure; very firm; many fine roots; distinct slickenside faces, 3 to 6 inches across, oriented approximately 30 degrees to the horizontal; neutral; gradual smooth boundary.

B22g—20 to 38 inches; dark gray (N 4/0) silty clay; many medium distinct brown (7.5YR 4/4) mottles; medium and coarse angular blocky structure; very firm; common fine roots; distinct slickenside faces, 4 to 6 inches across, oriented approximately 30 degrees to the horizontal; neutral; gradual smooth boundary.

B3g—38 to 43 inches; gray (5Y 5/1) silty clay; few fine distinct olive brown (2.5Y 5/6) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; very firm; common fine roots; slight effervescence; mildly alkaline; gradual smooth boundary.

C—43 to 60 inches; gray (N 5/0) silty clay; many medium distinct dark yellowish brown (10YR 4/4) mottles; massive; very firm; strong effervescence; moderately alkaline.

The solum is 36 to 50 inches thick. The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 0. It is silty clay or clay. The B2g horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 0. It is silty clay or clay. The C horizon has hue of 2.5Y or 5Y, value of 4 or 5, chroma of 1 or 0. It is clay or silty clay with thin strata of silt loam.

Landes series

The Landes series consists of well drained soils on broad flood plains. The soils formed in sandy alluvium. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slope ranges from 0 to 2 percent.

Landes soils are similar to Lomax soils and are commonly adjacent to Haymond soils and Petrolia soils in the landscape. Lomax soils have a thicker surface layer than Landes soils. Haymond soils have a lighter colored surface layer and formed in silty alluvium. Petrolia soils do not have a mollic epipedon and a gray mottled subsoil. They formed in silty alluvium and are in narrow elongated sloughs.

Typical pedon of Landes loamy sand, in a cultivated field, 330 feet south and 100 feet west of the northeast corner of donation 20, T. 3 N., R. 10 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

A12—10 to 14 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak medium granular structure; very friable; common fine roots; neutral; clear smooth boundary.

A13—14 to 18 inches; dark brown (10YR 3/3) loamy sand, brown (10YR 5/3) dry; weak medium granular structure; very friable; common fine roots; neutral; clear smooth boundary.

B2—18 to 35 inches; dark yellowish brown (10YR 4/4) loamy sand with thin layers of fine sandy loam; weak medium subangular blocky structure; friable; few fine roots; patchy very dark grayish brown (10YR 3/2) coatings in root channels and on faces of peds; neutral; clear smooth boundary.

C—35 to 60 inches; yellowish brown (10YR 5/4) fine sand with strata of fine sandy loam; single grain and massive; loose and friable; neutral.

The Ap horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The B horizon is loamy sand or fine sandy loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is fine sand, loamy fine sand, or fine sandy loam and contains thin strata of sandy loam or loam. Reaction ranges from neutral to mildly alkaline.

Lomax series

The Lomax series consists of well drained, moderately rapidly permeable soils on broad bottom lands. The soils formed in loamy alluvial sediment. Slope ranges from 0 to 2 percent. In Knox County, these soils are taxadjuncts to the Lomax series because they have a thinner and darker B horizon and a lower sand content in the control section. This difference, however, does not affect use and management for most common purposes.

Lomax soils are similar to Landes soils and are commonly adjacent to Haymond soils and Nolin soils in the landscape. Landes soils have more sand in the solum and a thinner surface layer than Lomax soils. Haymond soils and Nolin soils have lighter colored surface layers and have less sand and more silt in the sola.

Typical pedon of Lomax loam, in a cultivated field, 3,695 feet north and 40 feet east of the southwest corner of sec. 13, T. 1 N., R. 10 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A12—9 to 17 inches; very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; many fine roots; neutral; clear smooth boundary.

A13—17 to 25 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; common fine roots; very dark gray (10YR 3/1) coatings on faces of peds and as linings on voids; neutral; clear wavy boundary.

B2—25 to 32 inches; dark brown (10YR 3/3) loam, yellowish brown (10YR 5/4) dry; weak medium subangular blocky structure; friable; few fine roots; thin very dark grayish brown (10YR 3/2) coatings on faces of peds and in old root channels; neutral; clear smooth boundary.

B3—32 to 44 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak coarse subangular blocky structure; friable; neutral; gradual wavy boundary.

C—44 to 60 inches; dark yellowish brown (10YR 4/4) fine sand with thin strata of fine sandy loam; single grain and massive; loose and friable; neutral.

The solum is 28 to 40 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. It is 24 to 30 inches thick. The B2 horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. It is loam or fine sandy loam. The C horizon is fine sand or loamy fine sand and contains strata of loam or fine sandy loam. It is neutral or mildly alkaline.

Lyles series

The Lyles series consists of very poorly drained, moderately permeable soils on terraces and uplands. The soils formed in loamy over sandy outwash material. Slope ranges from 0 to 1 percent.

Lyles soils are commonly near Ayrshire soils, Bloomfield soils, and Alvin soils. Ayrshire soils have a browner subsoil with more clay and are on slightly higher positions in the landscape than Lyles soils. Bloomfield soils and Alvin soils are on higher positions and have brown subsoils that are free of mottles.

Typical pedon of Lyles fine sandy loam, in a cultivated field, 600 feet southwest of the east corner and then 700 feet northwest of the southeast boundary of donation 220, T. 5 N., R. 9 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) fine sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A12—10 to 17 inches; very dark gray (10YR 3/1) fine sandy loam, dark gray (10YR 4/1) dry; common medium distinct dark grayish brown (10YR 4/2) mottles; weak medium granular structure; friable; many fine roots; neutral; clear smooth boundary.

B21g—17 to 24 inches; gray (10YR 5/1) fine sandy loam; common medium distinct dark grayish brown (10YR 4/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; discontinuous thin very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; clear smooth boundary.

B22g—24 to 37 inches; dark gray (5Y 4/1) loam; common medium faint gray (5Y 5/1) and common medium distinct olive (5Y 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; neutral; clear smooth boundary.

B23g—37 to 54 inches; gray (5Y 5/1) stratified loam and sandy loam; many medium distinct light olive brown (2.5Y 5/4) mottles; weak coarse subangular blocky structure; friable; neutral; clear smooth boundary.

Cg—54 to 60 inches; grayish brown (2.5Y 5/2) fine sand with strata of sandy loam; common medium distinct brownish yellow (10YR 6/6) mottles; single grain; friable; mildly alkaline.

The solum is 40 to 60 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B2g horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2. It is sandy loam, fine sandy loam, or loam. The C horizon is fine sand or sand and contains strata of sandy loam in some pedons.

Markland series

The Markland series consists of well drained, slowly permeable soils on lacustrine plains. The soils formed in loess and underlying calcareous clayey lacustrine sediment. Slope ranges from 2 to 6 percent.

Markland soils are commonly adjacent to McGary soils and Zipp soils. McGary soils have mottles in the upper part of the subsoil and are on lower positions in the landscape than Markland soils. Zipp soils have more clay in the surface layer and a gray mottled subsoil and are on broad flats and sloughs.

Typical pedon of Markland silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 2,000 feet north of the southeast corner of sec. 21, T. 2 N., R. 8 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

B21t—9 to 24 inches; dark yellowish brown (10YR 4/4) silty clay; moderate medium angular blocky structure; firm; few fine roots; discontinuous thin dark brown (10YR 4/3) clay films on faces of peds; few pale brown (10YR 6/3) silt coatings on faces of peds; medium acid; clear smooth boundary.

B22t—24 to 39 inches; dark brown (10YR 4/3) silty clay; moderate medium subangular blocky structure; firm; continuous thin dark yellowish brown (10YR 3/4) clay films on faces of peds; neutral; clear wavy boundary.

C—39 to 60 inches; light olive brown (2.5Y 5/4) silty clay; common medium distinct pale brown (10YR 6/3) and light brownish gray (10YR 6/2) mottles; massive; firm; few black (10YR 2/1) iron and manganese oxide concretions; slight effervescence; mildly alkaline.

The solum is 30 to 44 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4 and ranges from medium acid to neutral. The C horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 4 to 6 and is clay or silty clay.

McGary series

The McGary series consists of somewhat poorly drained, slowly permeable soils on lacustrine plains and terraces. The soils formed in clayey, calcareous lacustrine sediment. Slope ranges from 0 to 2 percent.

McGary soils are commonly adjacent to Markland soils and Zipp soils. Markland soils have a browner profile and are on higher positions in the landscape than McGary soils. Zipp soils have more clay in the surface layer, have a gray mottled subsoil, and are on broad flats and sloughs.

Typical pedon of McGary silt loam, 0 to 2 percent slopes, in a cultivated field, 1,310 feet southeast of the north corner and then 990 feet southwest of the northeast boundary of donation 242, T. 4 N., R. 8 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

B21t—8 to 16 inches; yellowish brown (10YR 5/4) silty clay; few fine distinct gray (10YR 6/1) mottles; moderate medium angular blocky structure; firm; common fine roots; discontinuous thin grayish brown (10YR 5/2) clay films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide concretions; strongly acid; clear smooth boundary.

B22tg—16 to 26 inches; grayish brown (10YR 5/2) silty clay; common fine faint yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to strong medium angular blocky; firm; few fine roots; continuous thin gray (10YR 5/1) clay films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide concretions; medium acid; clear smooth boundary.

B23tg—26 to 37 inches; gray (10YR 5/1) silty clay; common fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse angular blocky structure; firm; continuous thin dark gray (10YR 4/1) clay films on faces of peds; many medium black (10YR 2/1) iron and manganese oxide concretions; slightly acid; gradual smooth boundary.

Cg—37 to 60 inches; gray (10YR 6/1) silty clay with strata of silty clay loam; many fine, distinct yellowish brown (10YR 5/4) mottles; massive; firm; discontinuous, thin dark gray (10YR 4/1) clay films in old root channels; many medium black (10YR 2/1) iron and manganese oxide concretions; slight effervescence; mildly alkaline.

The solum is 35 to 48 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4. Mottles are few to common. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3.

Nolin series

The Nolin series consists of well drained, moderately permeable soils on broad bottom lands. The soils formed in silty alluvial sediment. Slope ranges from 0 to 2 percent.

Nolin soils are similar to Armiesburg soils and Haymond soils and are commonly adjacent to Armiesburg soils, Petrolia soils, and Lomax soils. Armiesburg soils have a darker surface layer than Nolin soils. Haymond soils have less clay in the solum. Petrolia soils have gray mottled subhorizons and are in old channels. Lomax soils have a thick mollic epipedon and more sand in the subsoil.

Typical pedon of Nolin silty clay loam, rarely flooded, in a cultivated field, 1,820 feet east and 1,300 feet south of the northwest corner of sec. 5, T. 4 N., R. 7 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) silty clay loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B21—10 to 24 inches; brown (10YR 4/3) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; very dark brown (10YR 3/3) coatings on faces of peds and crack fills; neutral; clear smooth boundary.

B22—24 to 35 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate coarse subangular blocky structure; firm; few fine roots; few dark brown (10YR

3/3) coatings on faces of peds; neutral; clear smooth boundary.

B3—35 to 44 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; few fine roots; neutral; gradual wavy boundary.

C—44 to 60 inches; brown (10YR 5/3) silt loam; massive; friable; neutral.

The solum is 40 to 55 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The B2 horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 3 or 4. It is silty clay loam or silt loam and is slightly acid or neutral. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4 and is silt loam or loam. Some pedons have thin strata of silty clay loam or fine sand.

Patton series

The Patton series consists of poorly drained, moderately permeable soils on terraces and lacustrine plains. The soils formed in silty sediment. Slope ranges from 0 to 2 percent.

Patton soils are similar to Ragsdale soils and are commonly adjacent to Birds soils and Henshaw soils. Ragsdale soils have an argillic horizon. Birds soils do not have a mollic epipedon and are near stream channels. Henshaw soils have a lighter colored surface layer, have a browner subsoil, and are on higher positions in the landscape than Patton soils.

Typical pedon of Patton silt loam, in a cultivated field, 2,600 feet southwest of the north corner and then 1,100 feet southeast of the northwest boundary of donation 155, T. 3 N., R. 8 W.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, gray (10YR 5/1) dry; weak medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A12—10 to 17 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; friable; many fine roots; neutral; gradual smooth boundary.

B1g—17 to 22 inches; dark gray (5Y 4/1) silty clay loam; common fine distinct olive (5Y 5/6) and light olive brown (2.5Y 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; discontinuous thin very dark gray (10YR 3/1) organic coatings in crack fills and faces of peds; neutral; clear smooth boundary.

B2g—22 to 30 inches; gray (5Y 5/1) silty clay loam, common fine distinct light olive brown (2.5Y 5/4) and many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few fine roots; neutral; gradual smooth boundary.

B3g—30 to 37 inches; gray (5Y 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; mildly alkaline; gradual smooth boundary.

C—37 to 60 inches; mottled yellowish brown (10YR 5/6) and gray (5Y 6/1) silty clay loam with strata of silt loam; massive; friable; strong effervescence; moderately alkaline.

The solum is 36 to 42 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bg horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5; and chroma of 1, 2, or 0. It is slightly acid to mildly alkaline and contains common to many, fine to coarse distinct mottles. The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 6; and chroma of 1 or 2.

Peoga Variant

Peoga Variant consists of poorly drained, slowly permeable soils on terraces. The soils formed in acid silty and clayey material. Slope ranges from 0 to 2 percent.

Peoga Variant soils are similar to Vincennes soils and are commonly adjacent to Elkinsville soils. Vincennes soils have more sand in the solum than do Peoga Variant soils. Elkinsville soils have a brown profile that is free of mottles and is on higher positions in the landscape.

Typical pedon of Peoga Variant silt loam, in a cultivated field, 2,620 feet south and 120 feet west of the northeast corner of sec. 29, T. 1 N., R. 11 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A2g—7 to 10 inches; gray (10YR 5/1) silt loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak thick platy structure; friable; many fine roots; slightly acid; clear smooth boundary.

B21tg—10 to 22 inches; gray (10YR 5/1) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) and brown (7.5YR 4/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.

B22tg—22 to 39 inches; gray (10YR 5/1) silty clay; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; gray (10YR 6/1) silt coatings on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear irregular boundary.

B23tg—39 to 54 inches; gray (10YR 6/1) silty clay; common medium distinct dark yellowish brown

(10YR 4/4) mottles; weak coarse subangular blocky structure; firm; thin continuous gray (N 5/0) clay films and gray (10YR 5/1) silt coatings on faces of peds; few black (10YR 2/1) iron manganese oxide accumulations; very strongly acid; clear irregular boundary.

IICg—54 to 60 inches; gray (10YR 5/1) clay loam; common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; massive; firm; slightly acid.

The solum is 50 to 65 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The B2t horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam or silty clay. Reaction is very strongly acid to medium acid. The IIC horizon is medium acid or slightly acid.

Petrolia series

The Petrolia series consists of poorly drained, moderately slowly permeable soils on bottom lands. The soils formed in silty alluvium on flood plains. Slope ranges from 0 to 2 percent.

Petrolia soils are similar to Birds soils and Wakeland soils and are commonly adjacent to Armiesburg soils, Haymond soils, and Nolin soils in the landscape. Birds soils and Wakeland soils contain less clay and Wakeland soils have a browner profile than Petrolia soils. Armiesburg soils have a mollic epipedon, have no mottles in the upper part of the subsoil, and are on higher positions in the landscape. Haymond and Nolin soils contain less clay, have no mottles in the upper part of the subsoil, and are on higher lying positions.

Typical pedon of Petrolia silty clay loam, frequently flooded, in a cultivated field, 2,660 feet south and 1,370 feet east of the northwest corner of sec. 5, T. 1 S., R. 11 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B21g—7 to 20 inches; gray (10YR 5/1) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; firm; common fine roots; neutral; gradual smooth boundary.

B22g—20 to 54 inches; gray (10YR 5/1) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few fine roots; neutral; gradual smooth boundary.

Cg—54 to 60 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; neutral; gradual smooth boundary.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The B2g horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1. The underlying material below a depth of 40 inches contains strata of silt loam, loam, or clay loam in some areas. Reaction ranges from slightly acid to mildly alkaline.

Proctor series

The Proctor series consists of well drained, moderately permeable soils on alluvial terraces. The soils formed in loess or silty material and stratified loamy outwash. Slope ranges from 0 to 2 percent. In Knox County, these soils do not have the argillic horizon that is definitive for the Proctor series. This difference, however, does not affect use and management for most common purposes.

Proctor soils in most landscapes are near Armiesburg soils, Elkinsville soils, and Lomax soils. Armiesburg soils have less sand in the lower part of the solum than the Proctor soils. Elkinsville soils have a lighter colored surface layer, are more deeply leached, and are on higher positions in the landscape. Lomax soils have a thicker surface layer, have more sand in the upper part of the solum, and do not have an argillic horizon.

Typical pedon of Proctor silt loam, 0 to 2 percent slopes, in a cultivated field, 1,400 feet west and 700 feet north of the southeast corner of donation 9, T. 1 N., R. 11 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, very dark grayish brown (10YR 3/2) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A12—9 to 15 inches; very dark gray (10YR 3/1) silt loam, very dark grayish brown (10YR 3/2) dry; moderate medium granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

B1—15 to 20 inches; dark brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; common fine roots; few patchy very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; clear smooth boundary.

B21t—20 to 28 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; discontinuous dark brown (10YR 3/3) clay films on faces of peds; medium acid; gradual smooth boundary.

B22t—28 to 36 inches; dark yellowish brown (10YR 4/4) loam; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; few fine roots; continuous dark brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

B3t—36 to 52 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm;

discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; gradual smooth boundary.

C—52 to 60 inches; yellowish brown (10YR 5/4) fine sandy loam with strata of loam; common medium distinct grayish brown (10YR 5/2) and brown (10YR 5/8) mottles; massive; friable; medium acid; gradual smooth boundary.

The solum is 40 to 60 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The B2 horizon has hue of 10YR, value from 3 to 5, and chroma of 4 to 6. It is silt loam or silty clay loam. The B3 horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or loam. Some areas have strata of sandy loam or loamy sand in the lower part.

Ragsdale series

The Ragsdale series consists of very poorly drained, slowly permeable soils on nearly level to slightly depressed uplands. The soils formed in calcareous silty loess. Slope ranges from 0 to 2 percent.

Ragsdale soils are similar to Patton soils and are commonly adjacent to Iona soils and Reesville soils. Patton soils do not have an argillic horizon and contain more clay in the solum than Ragsdale soils. Iona soils have a browner profile and are on higher positions in the landscape. Reesville soils have a lighter colored surface layer and are on slightly higher positions.

Typical pedon of Ragsdale silt loam, in a cultivated field, 1,000 feet southeast of the north corner and then 500 feet southwest of the northeast boundary of donation 19, T. 2 N., R. 9 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A12—9 to 18 inches; very dark brown (10YR 2/2) silt loam, gray (10YR 5/1) dry; weak coarse subangular blocky structure; friable; common fine roots; neutral; clear wavy boundary.

B21t—18 to 29 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; clear smooth boundary.

B22t—29 to 46 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

C—46 to 60 inches; mottled gray (10YR 6/1) and yellowish brown (10YR 5/6) silt loam; massive; friable; slight effervescence; mildly alkaline.

The solum is 40 to 55 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B21t horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The B22t horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4. It is silty clay loam or silt loam. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 6. It is moderately alkaline or mildly alkaline.

Reesville series

The Reesville series consists of somewhat poorly drained, moderately slowly permeable soils on nearly level uplands. The soils formed in calcareous silty loess. Slope ranges from 0 to 2 percent.

Reesville soils are similar to Iva soils and are commonly adjacent to Iona soils and Ragsdale soils in the landscape. Iva soils have a thicker, more acid solum than Reesville soils. Iona soils have a browner profile and are on higher positions. Ragsdale soils have a dark surface and are in depressions.

Typical pedon of Reesville silt loam, 0 to 2 percent slopes, in a cultivated field, 650 feet east and 700 feet south of the northwest corner of donation 70, T. 3 N., R. 9 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; weak medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A2—8 to 13 inches; grayish brown (10YR 5/2) silt loam; common medium faint brown (10YR 5/3) mottles; weak thick platy structure parting to weak subangular blocky; friable; common fine roots; slightly acid; clear smooth boundary.

B21t—13 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; thick continuous dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—19 to 31 inches; light olive brown (2.5Y 5/4) silty clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thick continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few small black (10YR 2/1) iron and manganese oxide concretions; medium acid; clear wavy boundary.

B3—31 to 41 inches; light olive brown (2.5Y 5/4) silt loam; common medium distinct yellowish brown (10YR 5/6) and grayish brown (2.5Y 5/2) mottles;

weak coarse subangular blocky structure; friable; neutral; clear smooth boundary.

C—41 to 60 inches; grayish brown (2.5Y 5/2) silt loam; many medium distinct yellowish brown (10YR 5/6) and common medium faint light brownish gray (2.5Y 6/2) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 36 to 50 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. The A2 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3. The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. Some pedons have lower subhorizons with chroma of 2. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. It is neutral or moderately alkaline.

Selma series

The Selma series consists of poorly drained, moderately permeable soils on outwash terraces. The soils formed in loamy outwash underlain by stratified sandy material. Slope ranges from 0 to 2 percent.

Selma soils are commonly near Vincennes soils in the landscape. Vincennes soils have a lighter colored surface layer than the Selma soils.

Typical pedon of Selma loam, in a cultivated field, 1,450 feet east and 200 feet south of the northwest corner of sec. 1, T. 1 N., R. 10 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A12—9 to 15 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; many fine roots; neutral; clear smooth boundary.

B21g—15 to 24 inches; dark gray (10YR 4/1) sandy clay loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; weak coarse subangular blocky structure; firm; common fine roots; very dark gray (10YR 3/1) coatings in root channels; neutral; clear wavy boundary.

B22g—24 to 47 inches; dark gray (10YR 4/1) clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few dark reddish brown (5YR 3/3) iron segregations; thin dark gray (10YR 4/1) coatings in root channels; firm; neutral; clear wavy boundary.

B3g—47 to 52 inches; gray (10YR 5/1) sandy clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; firm; few fine roots; neutral; clear smooth boundary.

Cg—52 to 60 inches; light gray (10YR 6/1) stratified loamy sand, sand, and sandy loam; common medium faint grayish brown mottles; single grain; loose; slight effervescence; moderately alkaline.

The solum is 45 to 55 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It ranges from loam to clay loam. The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2, or is N 4/0 or N 5/0. The B2 horizon is clay loam or sandy clay loam.

Stockland series

The Stockland series consists of well drained, moderately rapidly permeable soils on broad terraces. The soils formed in loamy over sandy glacial outwash. Slope ranges from 0 to 2 percent.

Stockland soils are similar to Elston soils and are commonly adjacent to Selma and Conotton soils in the landscape. Selma soils have gray mottled subsoils and contain less gravel in the solum. Conotton soils have a lighter colored surface layer and have an argillic horizon.

Typical pedon of Stockland sandy loam, 0 to 2 percent slopes, in a cultivated field, 2,700 feet north and 200 feet east of the southwest corner of donation 36, T. 3 N., R. 11 W.

Ap—0 to 10 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak medium granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

A12—10 to 17 inches; very dark brown (10YR 2/2) sandy loam, dark gray (10YR 4/1) dry; weak medium granular structure; very friable; many fine roots; 12 percent gravel; neutral; clear smooth boundary.

B21—17 to 27 inches; dark brown (7.5YR 3/4) very gravelly sandy loam; weak medium subangular blocky structure; friable; common fine roots; 65 percent gravel; medium acid; clear smooth boundary.

B22—27 to 47 inches; brown (7.5YR 4/4) gravelly sandy loam; weak coarse subangular blocky structure; friable; few fine roots; 45 percent gravel; medium acid; gradual smooth boundary.

B3—47 to 80 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand; single grain; loose; 35 percent gravel; medium acid.

The solum is 50 to more than 80 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B2 horizon has hue of 10YR, 7.5YR, or 5YR; value of 3 to 5; and chroma of 2 to 4. It is very gravelly sandy loam with some individual horizons of very gravelly sandy clay loam or very gravelly loam. The gravel content of the B2 horizon ranges from 35 to 70 percent by volume. Reaction ranges from medium acid to neutral.

Sylvan series

The Sylvan series consists of well drained, moderately permeable soils on uplands. The soils formed in calcareous silty loess. Slope ranges from 2 to 40 percent.

Sylvan soils are similar to the Alford soils and are commonly adjacent to Iona soils and Reesville soils in the landscape. Alford soils have a thicker solum than Sylvan soils and are developed in leached loess. Iona soils have mottles in the lower part of the subsoil and are on lower positions in the landscape. Reesville soils have a grayer profile and are on broad flats.

Typical pedon of Sylvan silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 1,900 feet southwest of the east corner and then 1,100 feet northwest of the southeast boundary of donation 46, T. 3 N., R. 9 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; weak medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

B21t—7 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—18 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium and coarse subangular blocky structure; firm; common fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; medium acid; gradual wavy boundary.

B3t—29 to 38 inches; light olive brown (2.5Y 5/4) silt loam; weak coarse prismatic structure; friable; few fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

C—38 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; many medium prominent yellowish brown (10YR 5/8) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 30 to 40 inches thick. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 4 or 5. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4.

Vincennes series

The Vincennes series consists of poorly drained, slowly permeable soils on terraces. The soils formed in acid loamy alluvium. Slope ranges from 0 to 2 percent.

Vincennes soils are similar to Peoga soils and are commonly adjacent to Conotton soils and Selma soils in the landscape. Peoga soils have argillic horizons and contain less sand and more silt in the solum than do Vincennes soils. Conotton soils have argillic horizons, have a browner profile, and are on higher positions in the landscape. Selma soils have a mollic epipedon and are in depressions.

Typical pedon of Vincennes loam, in a cultivated field, 1,600 feet northwest of the east corner and then 1,600 feet southwest of the northeast boundary of donation 225, T. 2 N., R. 8 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

B21g—10 to 15 inches; gray (10YR 5/1) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few thin dark gray (10YR 4/1) organic coatings in root channels; common fine roots; few fine dark iron and manganese oxide concretions; medium acid; clear smooth boundary.

B22g—15 to 34 inches; gray (10YR 5/1) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic parting to moderate medium subangular blocky structure; firm; few fine dark iron and manganese oxide concretions; few fine roots; strongly acid; gradual smooth boundary.

B3g—34 to 54 inches; gray (10YR 5/1) clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; firm; common fine dark iron and manganese oxide concretions; strongly acid; clear wavy boundary.

Cg—54 to 60 inches; mottled light brownish gray (10YR 6/2), yellowish brown (10YR 5/4), and grayish brown (10YR 5/2) sandy loam with thin strata of clay loam; massive; firm; slightly acid.

The solum is 42 to 60 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The B2 horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. It is clay loam or sandy clay loam and medium acid to very strongly acid. The C horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 to 4. Textures include clay loam or loam with strata of fine sand. Reaction ranges from medium acid to neutral.

Wakeland series

The Wakeland series consists of somewhat poorly drained, moderately permeable soils on bottom lands. The soils formed in silty alluvial sediment. Slope ranges from 0 to 2 percent.

Wakeland soils are adjacent to Birds soils and Haymond soils in the landscape. Birds soils are grayer, have more clay in the subhorizons, and are on lower positions in the landscape. Haymond soils have a brown subsoil that has no mottles in the upper part and are on higher areas.

Typical pedon of Wakeland silt loam, frequently flooded, in a cultivated field, 2,000 feet southwest of the east corner and then 1,000 feet northwest of the southeast boundary of donation 187, T. 4 N., R. 9 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

C1g—7 to 23 inches; grayish brown (10YR 5/2) silt loam; many fine faint brown (10YR 5/3) mottles; weak medium granular structure; friable; common fine roots; neutral; clear wavy boundary.

C2g—23 to 29 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/4) and a few fine distinct gray (10YR 5/1) mottles; weak fine granular structure; friable; common fine roots; neutral; gradual wavy boundary.

C3g—29 to 60 inches; grayish brown (10YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; slightly acid.

The solum is medium acid to neutral. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The C horizon dominantly has hue of 10YR, value of 4 or 5, and chroma of 1 to 4. Between depths of 10 and 30 inches the soils have dominant values of 4 or 5 and chroma of 2. Mottles range from few to many and are faint to prominent. Texture is typically silt loam to a depth of 40 inches. Below 40 inches it is silt loam or stratified silt loam and sandy loam.

Wallkill series

The Wallkill series consists of very poorly drained soils in old river channels and lacustrine areas. The soils formed in alluvium and organic deposits. Permeability is moderate or moderately rapid in the upper part of the profile and varies widely in the lower part. Slope ranges from 0 to 2 percent.

Wallkill soils are commonly adjacent to Haymond soils, Vincennes soils, and Kings soils in the landscape. Unlike Wallkill soils, these soils are not underlain with organic deposits. Haymond soils are on higher positions, formed in silty material, and have a brown surface layer; the subsoil has no mottles. Vincennes soils formed in loamy material and have a gray mottled subsoil. Kings soils formed in clayey material and have a mollic epipedon.

Typical pedon of Wallkill silt loam, in a wooded area, 1,985 feet east and 1,330 feet south of the northwest corner of sec. 11, T. 1 S., R. 12 W.

A1—0 to 3 inches; dark grayish brown (2.5YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; few fine roots; neutral; clear smooth boundary.

B2g—3 to 17 inches; gray (5Y 5/1) silt loam, light gray (5Y 6/1) dry; common fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; common fine roots; few woody fragments; neutral; clear smooth boundary.

IIOa1—17 to 28 inches; very dark gray (5YR 3/1) sapric material; about 5 percent fibers rubbed; common medium distinct brown (7.5YR 4/4) mottles; massive breaking to thick platy structure; friable; slightly acid; clear smooth boundary.

IIOa2—28 to 48 inches; black (10YR 2/1) sapric material; about 5 percent fibers rubbed; common medium distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; slightly acid; clear wavy boundary.

IIOa3—48 to 60 inches; black (10YR 2/1) sapric material; less than 5 percent fibers rubbed; massive; friable; neutral.

The mineral soil over the organic soil material ranges from 16 to 20 inches in thickness. It has hue of 2.5Y, 5Y, or 10YR; value of 4 to 6; and chroma of 1 or 2. The organic soil material has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1, or it is N 2/0 or N 3/0. It is 5 to 20 percent fibers and woody fragments. Texture of the clayey substratum includes clay, silty clay, clay loam, and silty clay loam.

Zipp series

The Zipp series consists of very poorly drained, very slowly permeable soils on terraces. The soils formed in calcareous clayey lacustrine sediment. Slope ranges from 0 to 2 percent.

Zipp soils are commonly adjacent to Kings soils and Patton soils, which have a mollic epipedon. Patton soils contain less clay than do Zipp soils.

Typical pedon of Zipp silty clay, in a cultivated field, 1,650 feet northeast of the south corner and then 75 feet northwest of the southeast boundary of donation 66, T. 3 N., R. 9 W.

Ap—0 to 5 inches; dark gray (10YR 4/1) silty clay, light brownish gray (10YR 6/2) dry; very weak medium granular structure; firm; common fine roots; neutral; abrupt smooth boundary.

B1g—5 to 11 inches; dark gray (5Y 4/1) silty clay; common fine distinct light olive brown (2.5Y 5/4) mottles; weak medium angular blocky structure; firm; common fine roots; slightly acid; clear smooth boundary.

B21g—11 to 20 inches; dark gray (10YR 4/1) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse angular blocky structure; very firm; few fine roots; neutral; clear smooth boundary.

B22g—20 to 36 inches; dark gray (10YR 4/1) silty clay;

many medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate coarse angular blocky; very firm; few fine roots; few thin discontinuous gray (10YR 6/1) coatings on faces of peds; neutral; clear smooth boundary.

Cg—36 to 60 inches; mottled gray (10YR 6/1) and yellowish brown (10YR 5/6) silty clay; massive; very firm; slight effervescence; mildly alkaline.

The solum is 30 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. The B2g horizon has hue of 10YR, value of 4 or 5, and chroma of 1. The C horizon is silty clay or clay.

formation of the soils

This section consists of two parts. The first part tells how the factors of soil formation have affected the development of soils in Knox County. The second explains the processes of soil formation.

factors of soil formation

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic forces. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the *parent material;* the *climate* under which the soil material has accumulated and existed since accumulation; the *plant and animal life* on and in the soil; the *relief,* or lay of the land; and the length of *time* the forces of soil formation have acted on the soil material.

Climate and plant and animal life, especially plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material itself affects the kind of soil profile that is formed and, in some cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. It may be long or short, but some time is always required. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated that few generalizations can be made about the effect of any one factor unless conditions are known for the other four. Many of the processes of soil development are unknown.

parent material

Parent material is the unconsolidated mass from which a soil is formed. It determines the limits of the chemical and mineralogical composition of the soil. The parent materials of the soils of Knox County were transported by melt water from glaciers around 15,000 to 20,000 years ago. Some of the materials deposited by the water were subsequently reworked and redeposited by wind. The parent materials are of common glacial origin but their properties vary greatly, sometimes within small areas, depending on how the materials were deposited. The dominant parent materials in Knox County were deposited as outwash deposits, lacustrine deposits, windblown silt and sand, alluvium, and organic material.

Outwash materials were deposited by running water from melting glaciers, and the size of the particles that make up outwash material varies according to the velocity of the water. Where fast-moving water slowed down, the coarser particles were deposited. The slower water continued to carry finer particles, such as very fine sand, silt, and clay. Outwash deposits generally consist of layers of particles of similar size, such as medium sand, coarse sand, and gravel. A large outwash area, derived from the melt water of the Wisconsin glaciation, parallels the Wabash River. Elston soils are an example of soils formed in these outwash materials.

Lacustrine materials were deposited from still, or ponded, glacial melt water. Because the coarser fragments dropped out of the moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, were left to settle out in still water. Lacustrine deposits are silty or clayey. In Knox County soils that formed in lacustrine deposits are typically clayey, such as the Zipp soils.

When glaciers melted north of Knox County, gravel, sand, silt, and clay were washed out from the glacier, transported downstream by rivers, and deposited on the flood plains. When the flow of the rivers diminished, the flood plains dried out and winds picked up much of the sand and silt deposits. These wind-transported, or eolian, materials were efficiently sorted (*5*) into dune sands, with particles mainly 0.08 to .25mm in diameter, and loess, mainly 0.005 to 0.040mm in diameter (silt size). Dune sands were deposited in a belt immediately to the east of the glacial flood plain, much of which is now river terrace. Bloomfield soils and Alvin soils formed on dune sand deposits.

Loess was carried in suspension farther to the east and deposited over most of the county. This loess may be as thick as 30 feet in isolated areas, but commonly is around 10 to 12 feet thick near the loess source and thins to a few feet thick in the eastern part of the county (*6*). Alford soils formed on thick loess deposits, especially those underlain by more permeable outwash materials; Hosmer soils formed on deposits that are somewhat thinner, but still more than 5 feet thick, and that are underlain by less permeable buried soils, or paleosols (*8*).

Alluvial material was recently deposited by floodwaters of present streams. This material ranges in texture, depending on the speed of the water. The alluvium deposited along a swift stream, like the Wabash River, is coarser than that deposited along a slow, sluggish stream like Mariah Creek. Examples of alluvial soils are the Haymond soils and Wakeland soils.

Organic soils formed in lakes in outwash or lacustrine plains. Grasses and sedges growing around the edges of these lakes died, but their remains did not decompose. Later, white cedar and other water-tolerant trees grew on these areas. As these trees died, their residues became a part of the organic accumulation. The lakes were eventually filled with organic material and developed into areas of peat. This material subsequently decomposed into muck. Edwards Variant soils is an example of soils formed in organic material.

climate

Climate is important in the formation of soils. To a large extent, it determines the kind of plant and animal life on and in the soil. In addition, the precipitation determines the amount of water available for weathering of minerals, removal of the products of weathering, and the translocation of soil materials. The temperatures determine the rate of chemical reactions in the soil.

The climate in Knox County is cool and humid, and this is presumably similar to the climate under which the soils formed. Climate is uniform throughout the county, although its effect is modified locally by runoff or by proximity to the Wabash and White Rivers. Therefore, the differences between the soils of Knox County are only to a minor extent the results of differences in climate. The soils in Knox County differ, however, from soils formed in a warm, dry climate or from those that formed in a hot, moist climate.

plant and animal life

Plants have been the principal organism influencing the soils in Knox County, but bacteria, fungi, earthworms, and human civilization have also been important. Plant and animal life mainly adds organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kind of plants that grew on the soil. The remains of these plants decay and eventually become organic matter. As they decay, roots of the plants leave channels for downward movement of water through the soil and also add organic matter. Bacteria in the soil help to break down the organic matter so that it can be used by growing plants.

At one time, the vegetation in Knox County was mainly deciduous forests. The composition of the forests was affected by differences in natural soil drainage and minor changes in parent material.

In general, the well drained upland soils, such as Alford soils, Alvin soils, and Sylvan soils, were covered with tulip poplar, oak, hickory, elm, maple, and ash. The wet soils were covered primarily with sweetgum, hackberry, sycamore, cypress, and catalpa. A few wet soils also had swamp grasses, sedges, sphagnum, and other mosses that contributed substantially to the accumulation of organic matter. The Selma soils and Ragsdale soils developed under wet conditions and contain a considerable amount of organic matter. In the northwest part of the county a terrace area parallels the Wabash River mainly east of the bottom lands. The native vegetation here consisted of prairie grasses, and a large amount of organic matter from these grasses was incorporated in the surface layer. The soils of Knox County that developed under forest vegetation generally contain less organic matter than soils in other parts of the county that developed under grass vegetation. Elston soils are an example of soils that formed under grasses.

relief

Relief, or topography, has a marked influence on the soils of Knox County, through its influence on depth of the water table, erosion, plant cover, and soil temperature. In Knox County, slopes range from nearly level to very steep. Depth to the water table largely determines natural soil drainage, which ranges from well drained on the ridgetops to very poorly drained in the depressions.

Relief influences the formation of the soils by affecting water runoff and drainage. Runoff is greatest on the steeper slopes; in low areas water is temporarily ponded. Drainage affects aeration of the soil, which, in turn, affects the chemical composition and thus the color of the soil. Water and air move freely through soils that are well drained but slowly through soils that are very poorly drained. In soils that are well aerated, the iron and aluminum compounds that give most soils their color are oxidized and brightly colored; in poorly aerated soils the colors are dull gray and mottled. The Alford soils are an example of well drained, well aerated soils; Ragsdale soils are an example of poorly aerated, very poorly drained soils.

time

Time, usually a long time, is required for distinct horizons to be formed in the soil. Differences in the length of time that the parent materials have been in place are commonly reflected in differences in the degree of development of the soil profiles. Some soils have developed rapidly, others slowly.

The soils in Knox County range from young to mature. The deposits from which some of the soils in Knox County formed have been exposed to soil-forming factors for a long enough time to allow distinct horizons to develop. Other soils, however, forming in recent alluvial sediment, have not been in place long enough for distinct horizons to develop. The Wakeland soils with weakly developed horizons are an example of young soils formed in alluvial material; the Hosmer soils with distinct horizons are an example of older soils.

The leaching of lime is one effect of time. The older Alford soils and Hosmer soils at one time had as much lime in their sola as is now in their C horizons. Alford soils are now leached of lime to a depth of 80 inches or more. Other factors, however, also affect leaching. The Zipp soils, which were submerged for a time under glacial lake water and protected from leaching, are limy or calcareous at a depth of 36 inches. In contrast, the Elkinsville soils were above water and subject to leaching.

processes of soil formation

Several processes are involved in the formation of the soils. These processes include the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and bases; and the liberation and translocation of silicate clay minerals. In most soils, more than one process has been active in horizon differentiation.

Some organic matter has accumulated in the surface layer of all the soils in the county. The organic matter content of some soils is low, but that of others is high. Generally, the soils that have the most organic matter, such as the Ragsdale soils and Lomax soils, have a thick, black surface horizon.

Leaching is generally believed to precede the translocation of silicate clay minerals. Carbonates and bases have been leached from the upper horizons of nearly all the soils of this county. Most all of the carbonates and some of the bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by an acid reaction. Leaching of wet soils is slow because of high water tables or because water moves slowly through such soils.

Clay accumulates in pores and other voids and forms films on the surfaces along which water moves. Leaching of bases and translocation of silicate clays are among the more important processes in horizon differentiation in the soils of Knox County. Alford soils are an example of soils in which translocated silicate clays have accumulated in the B2t horizon in the form of clay films.

The reduction and transfer of iron, or gleying, has occurred in all of the very poorly drained, poorly drained, and somewhat poorly drained soils of the county. In these naturally wet soils this process has been significant in horizon differentiation and is characterized by the gray color of the subsoil. Reduction is commonly accompanied by some transfer of the iron, either from upper horizons to lower horizons or completely out of the profile. Mottles, spots, or flecks of one color in the background of another color indicate redistribution and segregation of iron.

references

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. I0, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. In 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Barnhart, John D. and Dorothy L. Riker. Indiana to 1816: the colonial period. 520 pp., illus.

(4) Conservation Needs Committee. 1968. Indiana soil and water conservation needs inventory. 224 pp., illus.

(5) Franzmeier, D. P. 1970. Particle size sorting of proglacial eolian materials. Soil Sci. Soc. Am. Proc. 34: 920-924, illus.

(6) Harlan, P. W. and D. P. Franzmeier. 1977. Soil formation on loess in southwestern Indiana: I. Loess stratigraphy and soil morphology. Soil Sci. Soc. Am. J. 41: 93-98, illus.

(7) Malott, Clyde A. 1922. The physiography of Indiana. *In* the handbook of Indiana geology, part 2. Conserv. 21: 59-256, illus.

(8) Norton, L. D. and D. P. Franzmeier. 1978. Topsequences of loess-derived soils in southwestern Indiana. Soil Sci. Soc. Am. J. 42: 622-627, illus.

(9) Ulrich, H. P. and others. 1943. Soil survey of Knox County, Indiana. Series 1934, No. 23. U.S. Dep. Agr.

(10) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

(11) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

glossary

ABC soil. A soil having an A, a B, and a C horizon.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compact layers to depths below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves at least part of the crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the removal of water from the soil. Drainage classes are determined on the basis of an overall evaluation of water removal as influenced by climate, slope, and position on the landscape. Precipitation, runoff, amount of moisture infiltrating the soil, and rate of water movement through the soil affect the degree and duration of wetness. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow, very porous, or steep, or a combination of these.

Somewhat excessively drained.—Water is removed from the soil rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow or moderately deep, very porous, or steep, or a combination of these.

Well drained.—Water is removed from the soil so readily that the upper 40 inches generally does not have the mottles or dull colors related to wetness.

Moderately well drained.—Water is removed from the soil so slowly that the upper 20 to 40 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Somewhat poorly drained.—Water is removed from the soil so slowly that the upper 10 to 20 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Poorly drained.—Water is removed so slowly that either the soil is periodically saturated or the upper 10 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water is at or on the surface most of the time. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainage, subsurface. Removal of excess ground water by drains installed within the soil profile. The drains collect the water and convey it to a gravity or pump outlet.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A horizon, including all subdivisions of this horizon (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Underlying material. (See substratum.)

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Based on data recorded in the period 1951-74 at Vincennes, Indiana]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days[1]	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	°F	°F	°F	°F	°F		In	In	In		In
January----	38.6	20.2	29.4	67	-9	25	2.65	1.41	3.65	5	3.1
February---	42.9	23.2	33.1	69	-5	45	2.50	1.27	3.50	6	3.1
March------	52.0	31.3	41.7	80	10	177	3.92	2.05	5.43	8	2.8
April------	66.0	43.5	54.8	86	24	444	4.17	2.42	5.58	8	.2
May--------	75.8	52.2	64.0	93	33	744	4.35	2.42	5.92	8	.0
June-------	85.1	61.6	73.4	99	45	1,002	4.04	2.57	5.37	6	.0
July-------	88.3	65.2	76.8	99	50	1,141	4.15	1.72	6.11	6	.0
August-----	87.0	62.6	74.8	98	48	1,079	3.54	1.21	5.39	5	.0
September--	81.7	55.6	68.7	97	37	861	3.07	1.44	4.44	5	.0
October----	70.4	43.4	56.9	90	25	524	2.30	.98	3.36	4	.0
November---	54.2	32.8	43.5	79	12	150	3.58	1.79	5.03	6	1.2
December---	42.4	24.7	33.6	69	-2	65	3.41	1.76	4.75	7	2.7
Yearly:											
Average--	65.4	43.0	54.2	---	---	---	---	---	---	---	---
Extreme--	---	---	---	101	-10	---	---	---	---	---	---
Total----	---	---	---	---	---	6,257	41.68	35.71	47.40	74	13.1

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Based on data recorded in the period 1951-74 at Vincennes, Indiana]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 5	April 16	April 26
2 years in 10 later than--	April 1	April 12	April 22
5 years in 10 later than--	March 24	April 5	April 13
First freezing temperature in fall:			
1 year in 10 earlier than--	October 26	October 19	October 5
2 years in 10 earlier than--	October 30	October 22	October 10
5 years in 10 earlier than--	November 7	October 29	October 19

TABLE 3.--GROWING SEASON

[Based on data recorded in the period 1951-74 at Vincennes, Indiana]

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	212	193	174
8 years in 10	217	198	179
5 years in 10	227	207	188
2 years in 10	236	216	198
1 year in 10	241	221	203

TABLE 4.--POTENTIAL AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Extent of area	Cultivated crops	Woodland	Urban uses	Intensive recreation areas
	Pct				
1. Alford-Sylvan	35	Good	Good	Fair: slopes.	Fair: slopes.
2. Selma-Armiesburg-Vincennes	23	Good	Fair: wetness.	Poor: wetness.	Poor: wetness.
3. Haymond-Nolin-Petrolia	13	Good	Good	Poor: floods.	Poor: floods.
4. Hosmer-Sylvan	9	Good	Good	Fair: slopes, wetness.	Fair: slopes, wetness.
5. Princeton-Bloomfield-Ayrshire	8	Good	Good	Fair: slopes, wetness.	Fair: too sandy slopes.
6. Stockland-Conotton-Elston	8	Good	Poor: droughty.	Good	Good.
7. Reesville-Ragsdale	4	Good	Fair: wetness.	Poor: wetness.	Poor: wetness.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AdB	Ade loamy fine sand, 2 to 6 percent slopes	1,889	0.6
AlA	Alford silt loam, 0 to 2 percent slopes	1,655	0.5
AlB2	Alford silt loam, 2 to 6 percent slopes, eroded	32,045	9.6
AlC2	Alford silt loam, 6 to 12 percent slopes, eroded	18,043	5.4
AlD3	Alford silt loam, 12 to 18 percent slopes, severely eroded	8,899	2.7
AnB	Alvin fine sandy loam, 2 to 6 percent slopes	8,257	2.5
AnC	Alvin fine sandy loam, 6 to 12 percent slopes	2,453	0.7
AnD	Alvin fine sandy loam, 12 to 18 percent slopes	1,036	0.3
Ar	Armiesburg silty clay loam, rarely flooded	15,234	4.6
Ay	Ayrshire fine sandy loam	8,428	2.5
Bd	Birds silt loam	2,623	0.8
BlB	Bloomfield loamy fine sand, 2 to 10 percent slopes	7,487	2.2
BlD	Bloomfield loamy fine sand, 12 to 18 percent slopes	1,198	0.4
ChC	Chelsea loamy fine sand, 4 to 10 percent slopes	1,174	0.3
ClF	Chetwynd loam, 25 to 50 percent slopes	2,137	0.6
CoA	Conotton sandy loam, 0 to 3 percent slopes	6,221	1.9
Du	Dumps, mine	443	0.1
Ed	Edwards Variant muck, drained	561	0.2
EkA	Elkinsville silt loam, 0 to 2 percent slopes	2,182	0.6
ElA	Elston sandy loam, 0 to 3 percent slopes	4,203	1.3
FaB	Fairpoint shaly silt loam, 0 to 8 percent slopes	2,556	0.8
FbG	Fairpoint very shaly silt loam, 35 to 90 percent slopes	1,214	0.4
Ha	Haymond silt loam, frequently flooded	10,664	3.2
Hb	Haymond silt loam, rarely flooded	2,768	0.8
Hc	Haymond Variant loamy sand, frequently flooded	603	0.2
HeA	Henshaw silt loam, 0 to 2 percent slopes	883	0.3
HkF	Hickory loam, 25 to 50 percent slopes	9,464	2.8
HoA	Hosmer silt loam, 0 to 2 percent slopes	1,178	0.3
HoB2	Hosmer silt loam, 2 to 6 percent slopes, eroded	8,998	2.7
HoC3	Hosmer silt loam, 6 to 12 percent slopes, severely eroded	5,092	1.5
HoD3	Hosmer silt loam, 12 to 18 percent slopes, severely eroded	1,637	0.5
IoA	Iona silt loam, 0 to 2 percent slopes	4,907	1.5
IvA	Iva silt loam, 0 to 2 percent slopes	1,860	0.5
Kn	Kings silty clay	2,914	0.9
La	Landes loamy sand	478	0.1
Lo	Lomax loam	4,205	1.3
Ly	Lyles fine sandy loam	6,192	1.8
MbB2	Markland silt loam, 2 to 6 percent slopes, eroded	560	0.2
McA	McGary silt loam, 0 to 2 percent slopes	409	0.1
No	Nolin silty clay loam, rarely flooded	11,838	3.5
Pb	Patton silt loam	10,253	3.1
Pg	Peoga Variant silt loam	1,419	0.4
Po	Petrolia silty clay loam, frequently flooded	9,125	2.7
PsA	Proctor silt loam, 0 to 2 percent slopes	1,449	0.4
Ra	Ragsdale silt loam	6,623	2.0
ReA	Reesville silt loam, 0 to 2 percent slopes	7,625	2.3
Sa	Selma loam	15,216	4.5
Sc	Selma clay loam	6,433	1.9
SdA	Stockland sandy loam, 0 to 2 percent slopes	6,592	2.0
SyB2	Sylvan silt loam, 2 to 6 percent slopes, eroded	18,055	5.4
SyC3	Sylvan silt loam, 6 to 12 percent slopes, severely eroded	3,316	1.0
SyD3	Sylvan silt loam, 12 to 18 percent slopes, severely eroded	1,709	0.5
SyF	Sylvan silt loam, 25 to 40 percent slopes	3,143	0.9
UdB	Udorthents, gently sloping	494	0.1
Vn	Vincennes loam	8,249	2.5
Vo	Vincennes clay loam, gravelly substratum	1,895	0.6
Wa	Wakeland silt loam, frequently flooded	13,918	4.2
Wb	Wallkill silt loam	615	0.2
Wc	Wallkill silt loam, clayey substratum	615	0.2
Zp	Zipp silty clay	5,600	1.7
Zt	Zipp silty clay, frequently flooded	3,948	1.2
	Water	3,200	1.0
	Total	334,080	100.0

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
AdB----------------------- Ade	75	26	34	2.5	5.0
AlA----------------------- Alford	125	44	50	4.1	8.2
AlB2---------------------- Alford	120	42	48	4.0	8.0
AlC2---------------------- Alford	110	38	44	3.6	7.2
AlD3---------------------- Alford	---	---	---	3.0	6.0
AnB----------------------- Alvin	97	33	48	4.3	8.6
AnC----------------------- Alvin	92	31	45	4.0	8.0
AnD----------------------- Alvin	83	---	41	3.7	7.4
Ar------------------------ Armiesburg	145	50	54	4.4	8.8
Ay------------------------ Ayrshire	115	40	46	3.8	7.6
Bd------------------------ Birds	122	42	52	4.4	8.8
BlB----------------------- Bloomfield	75	29	39	3.0	6.0
BlD----------------------- Bloomfield	---	---	---	2.9	5.8
ChC----------------------- Chelsea	60	25	30	1.8	3.6
ClF----------------------- Chetwynd	---	---	---	---	3.2
CoA----------------------- Conotton	80	28	35	3.0	6.0
Du**. Dumps					
Ed------------------------ Edwards Variant	90	34	34	3.0	6.0
EkA----------------------- Elkinsville	120	42	48	4.0	8.0
ElA----------------------- Elston	95	32	45	3.0	6.0
FaB----------------------- Fairpoint	---	---	30	3.0	3.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
FbG----------------------- Fairpoint	---	---	---	---	---
Ha----------------------- Haymond	110	39	42	3.7	8.0
Hb----------------------- Haymond	130	44	50	4.1	8.2
Hc----------------------- Haymond Variant	70	25	30	3.5	4.5
HeA----------------------- Henshaw	110	45	50	4.0	6.0
HkF----------------------- Hickory	---	---	---	4.0	4.0
HoA----------------------- Hosmer	110	40	47	3.4	6.8
HoB2----------------------- Hosmer	100	35	43	3.1	6.2
HoC3----------------------- Hosmer	80	30	34	2.5	5.0
HoD3----------------------- Hosmer	---	---	27	2.0	4.0
IoA----------------------- Iona	130	44	50	4.1	8.2
IvA----------------------- Iva	135	47	54	4.4	8.8
Kn----------------------- Kings	105	40	52	3.8	7.6
La----------------------- Landes	99	34	45	3.7	5.0
Lo----------------------- Lomax	120	40	45	4.4	5.5
Ly----------------------- Lyles	120	47	54	4.4	8.8
MbB2----------------------- Markland	80	28	36	2.6	5.2
McA----------------------- McGary	100	35	45	2.3	4.6
No----------------------- Nolin	135	45	---	4.5	5.5
Pb----------------------- Patton	148	48	56	5.6	6.0
Pg----------------------- Peoga Variant	125	44	50	4.1	8.2
Po----------------------- Petrolia	110	38	45	4.2	6.0
PsA----------------------- Proctor	144	44	59	5.5	6.8

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
Ra: Ragsdale	155	54	62	5.1	10.2
ReA: Reesville	135	47	48	4.5	9.0
Sa, Sc: Selma	130	44	52	4.5	8.8
SdA: Stockland	82	28	43	3.7	8.5
SyB2: Sylvan	111	35	52	4.9	6.2
SyC3: Sylvan	85	27	40	3.8	5.0
SyD3: Sylvan	---	---	---	3.3	4.0
SyF: Sylvan	---	---	---	3.7	3.5
UdB**: Udorthents					
Vn, Vo: Vincennes	130	46	52	4.3	8.6
Wa: Wakeland	115	40	46	4.4	8.8
Wb: Wallkill					
Wc: Wallkill	100	45	---	3.5	7.0
Zp: Zipp	105	37	42	3.4	6.8
Zt: Zipp	80	20	---	---	3.4

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	44,238	---	---	---
II	180,100	67,355	107,364	5,381
III	50,419	21,056	14,183	15,180
IV	22,614	9,444	4,509	8,661
V	---	---	---	---
VI	19,142	15,388	---	3,754
VII	12,815	12,815	---	---
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
AdB: Ade	---	--------	--------	--------	--------		---	Eastern white pine, red pine.
AlA, AlB2, AlC2, AlD3: Alford	1o	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar	98	
						Sweetgum	76	
AnB, AnC: Alvin	2o	Slight	Slight	Slight	Slight	White oak	80	Green ash, black walnut, yellow-poplar, white oak, eastern white pine, American sycamore, sugar maple.
						Northern red oak	80	
						Black walnut	---	
						Yellow-poplar	90	
AnD: Alvin	2r	Moderate	Moderate	Slight	Slight	White oak	80	Green ash, black walnut, yellow-poplar, white oak, eastern white pine, American sycamore, sugar maple.
						Northern red oak	80	
						Black walnut	---	
						Yellow-poplar	90	
Ar: Armiesburg	1o	Slight	Slight	Slight	Slight	Yellow-poplar	100	Eastern white pine, black walnut, yellow-poplar.
						White oak	90	
						Black walnut	70	
Ay: Ayrshire	1o	Slight	Slight	Slight	Slight	White oak	85	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak	100	
						Yellow-poplar	100	
						Sweetgum	100	
Bd: Birds	2w	Slight	Severe	Moderate	Slight	Eastern cottonwood	100	Eastern cottonwood, red maple, American sycamore, baldcypress, water tupelo.
						Pin oak	90	
						Sweetgum	---	
						Cherrybark oak	---	
						American sycamore	---	
BlB, BlD: Bloomfield	3s	Slight	Slight	Moderate	Slight	Black oak	70	Eastern white pine, red pine, jack pine.
						White oak	---	
						Scarlet oak	---	
ChC: Chelsea	3s	Slight	Slight	Moderate	Slight	White oak	70	Eastern white pine, red pine.
						Red pine	72	
						Eastern white pine	83	
						Jack pine	70	
						Quaking aspen	72	
						Northern red oak	70	
ClF: Chetwynd	1r	Severe	Severe	Slight	Slight	Yellow-poplar	99	Eastern white pine, black walnut, yellow-poplar, red pine.
						Northern red oak	88	
CoA: Conotton	3s	Slight	Slight	Moderate	Slight	White oak	70	Eastern white pine, red pine, white oak, yellow-poplar, northern red oak.
						Northern red oak	70	
						Black cherry	---	
						Black oak	---	
						Scarlet oak	---	
						Red maple	---	
						Yellow-poplar	---	

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
Ed------------------ Edwards Variant	3w	Slight	Severe	Severe	Severe	Red maple-----------	51	
						Silver maple--------	76	
						White ash-----------	51	
						Quaking aspen-------	---	
						Eastern cottonwood--	---	
						Northern white-cedar	27	
						Green ash-----------	---	
						Black cherry--------	---	
EkA----------------- Elkinsville	1o	Slight	Slight	Slight	Slight	White oak-----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
						Sweetgum------------	76	
ElA----------------- Elston	--	--------	--------	--------	--------		---	Black walnut, American sycamore, eastern cottonwood, green ash, bur oak, common hackberry, eastern white pine, red pine.
FaB, FbG------------ Fairpoint	1r	--------	--------	--------	--------		---	Eastern white pine, yellow-poplar.
Ha, Hb-------------- Haymond	1o	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Eastern white pine, black walnut, yellow-poplar.
						White oak-----------	90	
						Black walnut--------	70	
Hc------------------ Haymond Variant	1o	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Eastern white pine, black walnut, yellow-poplar.
						White oak-----------	90	
						Black walnut--------	70	
HeA----------------- Henshaw	1o	Slight	Slight	Slight	Slight	Pin oak-------------	95	White ash, sweetgum, eastern cottonwood, yellow-poplar.
						Yellow-poplar-------	95	
						Sweetgum------------	95	
HkF----------------- Hickory	1r	Severe	Severe	Slight	Slight	White oak-----------	85	Eastern white pine, red pine, yellow-poplar, sugar maple, white oak, black walnut.
						Northern red oak----	85	
						Black oak-----------	---	
						Green ash-----------	---	
						Bitternut hickory---	---	
						Yellow-poplar-------	95	
HoA, HoB2, HoC3----- Hosmer	2o	Slight	Slight	Slight	Slight	White oak-----------	75	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
						Yellow-poplar-------	90	
						Virginia pine-------	75	
						Sugar maple---------	75	
HoD3---------------- Hosmer	2r	Moderate	Moderate	Slight	Slight	White oak-----------	75	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
						Yellow-poplar-------	90	
						Virginia pine-------	75	
						Sugar maple---------	75	
IoA----------------- Iona	1o	Slight	Slight	Slight	Slight	White oak-----------	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar-------	98	
						Sweetgum------------	76	
IvA----------------- Iva	2o	Slight	Slight	Slight	Slight	White oak-----------	75	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak-------------	85	
						Yellow-poplar-------	85	
						Sweetgum------------	80	

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns: Erosion hazard	Management concerns: Equip- ment limita- tion	Management concerns: Seedling mortal- ity	Management concerns: Wind- throw hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Kn----------------- Kings	2w	Slight	Severe	Severe	Severe	Pin oak------------- White oak----------- Sweetgum------------ Northern red oak----	86 75 90 75	Eastern white pine, baldcypress, red maple, white ash, sweetgum.
La----------------- Landes	1o	Slight	Slight	Slight	Slight	Eastern cottonwood-- Yellow-poplar------- American sycamore--- Sweetgum------------ Green ash-----------	105 95 --- --- ---	Eastern cottonwood, yellow-poplar, American sycamore, sweetgum, green ash, black walnut, eastern white pine, sugar maple.
Lo----------------- Lomax	---	--------	--------	--------	--------		---	Black walnut, American sycamore, eastern cottonwood, green ash, bur oak, common hackberry, eastern white pine, red pine.
Ly----------------- Lyles	2w	Slight	Severe	Severe	Severe	Pin oak------------- White oak----------- Sweetgum------------ Northern red oak----	88 75 90 76	Eastern white pine, baldcypress, Norway spruce, red maple, white ash, sweetgum.
MbB2--------------- Markland	2c	Slight	Slight	Severe	Severe	White oak----------- Northern red oak----	75 78	Eastern white pine, red pine, yellow-poplar, white ash.
McA---------------- McGary	3w	Slight	Moderate	Severe	Severe	White oak----------- Pin oak------------- Yellow-poplar------- Sweetgum------------	70 85 85 80	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
No----------------- Nolin	1o	Slight	Slight	Slight	Slight	Sweetgum------------	85	Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak.
Pb----------------- Patton	2w	Slight	Severe	Moderate	Moderate	Pin oak------------- White oak----------- Sweetgum------------ Northern red oak----	85 75 80 75	Eastern white pine, baldcypress, red maple, white ash, sweetgum.
Pg----------------- Peoga Variant	2w	Slight	Severe	Severe	Moderate	Pin oak------------- White oak----------- Sweetgum------------	90 75 90	Eastern white pine, baldcypress, red maple, white ash, sweetgum.
Po----------------- Petrolia	2w	Slight	Moderate	Moderate	Slight	Eastern cottonwood-- Pin oak------------- Sweetgum------------ Cherrybark oak------ American sycamore---	100 90 --- --- ---	Eastern cottonwood, red maple, American sycamore, baldcypress, water tupelo.
PsA---------------- Proctor	---	--------	--------	--------	--------		---	Black walnut, green ash, red maple, eastern white pine, red pine.
Ra----------------- Ragsdale	2w	Slight	Severe	Severe	Severe	Pin oak------------- White oak----------- Sweetgum------------	90 75 90	Eastern white pine, baldcypress, red maple, white ash, sweetgum.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
ReA Reesville	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple White ash White oak Black walnut Black cherry	76 86 90 --- --- --- ---	Eastern white pine, white ash, red maple, black cherry, black walnut, red pine, northern red oak.
Sa, Sc Selma	---	--------	--------	--------	--------		---	American sycamore, common hackberry, European larch, green ash, pin oak, red maple, swamp white oak.
SdA Stockland	---	--------	--------	--------	--------		--	Black walnut, American sycamore, eastern cottonwood, green ash, bur oak, common hackberry, eastern white pine, red pine.
SyB2, SyC3 Sylvan	2o	Slight	Slight	Slight	Slight	Yellow-poplar White oak Northern red oak Black walnut	90 80 80 ---	White oak, black walnut, northern red oak, green ash, eastern white pine, red pine, sugar maple.
SyD3, SyF Sylvan	2r	Moderate	Moderate	Moderate	Slight	Yellow-poplar White oak Northern red oak Black walnut	90 80 80 ---	White oak, black walnut, northern red oak, green ash, eastern white pine, red pine, sugar maple.
Vn, Vo Vincennes	2w	Slight	Severe	Severe	Moderate	Pin oak White oak Sweetgum	86 75 90	Eastern white pine, baldcypress, red maple, white ash, sweetgum.
Wa Wakeland	2o	Slight	Slight	Slight	Slight	Pin oak Sweetgum Yellow-poplar Virginia pine	90 88 90 85	Eastern white pine, baldcypress, American sycamore, red maple, white ash.
Wb, Wc Wallkill	4w	Slight	Severe	Severe	Severe	Pin oak Red maple Sweetgum	70 65 70	Eastern white pine, white ash, red maple, sweetgum.
Zp Zipp	2w	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum	88 75 90	Eastern white pine, baldcypress, red maple, white ash, sweetgum.
Zt Zipp	2w	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum	86 75 90	Eastern white pine, baldcypress, red maple, white ash, sweetgum.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
AdB: Ade	Siberian peashrub	Eastern redcedar, Amur honeysuckle, late lilac, autumn-olive, Washington hawthorn, Virginia crab-apple.	Red pine, jack pine, Austrian pine.	Eastern white pine.	---
AlA, AlB2, AlC2, AlD3: Alford	Redosier dogwood	Sargents crabapple whitebelle honey-suckle, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autunn-olive.	Washington hawthorn, eastern redcedar, northern white-cedar, Amur maple, Amur privet, green ash.	Norway spruce, Austrian pine, red pine, pin oak	Eastern white pine.
AnB, AnC, AnD: Alvin	Siberian peashrub, gray dogwood.	Eastern redcedar, Amur honeysuckle, silky dogwood, autumn-olive, Washington hawthorn, Virginia crab-apple.	Red pine, eastern redcedar, jack pine, Austrian pine.	Eastern white pine.	
Ar: Armiesburg	Redosier dogwood	Amur privet, late lilac, Amur honeysuckle, Sargents crab-apple, American cranberrybush, autumn-olive.	Eastern redcedar, blue spruce, white spruce, Austrian pine, red pine, green ash, osageorange.	Norway spruce, baldcypress, Chinese elm, European alder, green ash.	Eastern white pine, Imperial Carolina poplar, pin oak.
Ay: Ayrshire	Redosier dogwood	Blackhaw, Amur privet, Amur honeysuckle, American cranberrybush, autumn-olive, Sargents crab-apple.	Eastern redcedar, blue spruce, white spruce, Austrian pine, red pine, green ash, osageorange.	Norway spruce, baldcypress, Chinese elm, European alder, green ash.	Eastern white pine, Imperial Carolina poplar, pin oak.
Bd: Birds	Redosier dogwood, Sargents crabapple.	Silky dogwood, Amur honeysuckle, Tatarian honey-suckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
BlB, BlD: Bloomfield	Siberian peashrub, gray dogwood.	Eastern redcedar, autumn-olive, radiant crab-apple, Washington hawthorn, Amur honeysuckle.	Jack pine, red pine.	Eastern white pine, Austrian pine.	---
ChC: Chelsea	Siberian peashrub, gray dogwood.	Eastern redcedar, autumn-olive, radiant crab-apple, Washington hawthorn, Amur honeysuckle.	Red pine, Austrian pine.	Eastern white pine	---

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
ClF------------- Chetwynd	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
CoA------------- Conotton	Tatarian honeysuckle, Amur honeysuckle.	Scotch pine, Amur privet, autumn-olive, Washington hawthorn.	Eastern redcedar, Austrian pine, northern white-cedar, osage-orange.	Eastern white pine, red pine, Norway spruce.	---
Du*. Dumps					
Ed-------------- Edwards Variant	Gray dogwood, common ninebark, whitebelle honeysuckle.	Amur honeysuckle, redosier dogwood, silky dogwood, Tatarian honeysuckle, nannyberry viburnum, Amur privet.	Northern white-cedar, tall purple willow.	Baldcypress, black willow, golden willow.	Imperial Carolina poplar.
EkA------------- Elkinsville	---	Amur honeysuckle, Amur privet, American cranberrybush, autumn-olive.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
ElA------------- Elston	---	Tatarian honeysuckle, Amur honeysuckle, Washington hawthorn, Amur privet, American cranberrybush, autumn-olive.	Osageorange, northern white-cedar, eastern redcedar, Austrian pine.	Red pine, Norway spruce.	Eastern white pine.
FaB, FbG. Fairpoint					
Ha, Hb---------- Haymond	---	Amur privet, Amur honeysuckle, American cranberrybush, autumn-olive, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Hc-------------- Haymond Variant	---	Amur privet, Amur honeysuckle, American cranberrybush, autumn-olive, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
HeA------------- Henshaw	---	Amur privet, Amur honeysuckle, American cranberrybush, autumn-olive, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
HkF------------- Hickory	Silky dogwood-----	Amur privet, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
HoA, HoB2, HoC3, HoD3: Hosmer	---	Tatarian honeysuckle, arrowwood, Amur privet, Amur honeysuckle, American cranberrybush, autumn-olive.	Washington hawthorn, eastern redcedar, osage-orange, green ash, Austrian pine.	Pin oak	Eastern white pine.
IoA: Iona	---	Silky dogwood, Amur honeysuckle, American cranberrybush, autumn-olive, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
IvA: Iva	---	Amur privet, Amur honeysuckle, American cranberrybush, autumn-olive, silky dogwood.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce	Eastern white pine, pin oak.
Kn: Kings	---	Amur honeysuckle, redosier dogwood, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce, eastern white pine.	Pin oak.
La: Landes	---	Silky dogwood, autumn-olive, American cranberrybush, Amur honeysuckle, Amur privet.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Lo: Lomax	---	Amur honeysuckle, autumn-olive, silky dogwood, Amur privet, Washington hawthorn, American cranberrybush, Tatarian honeysuckle.	Osageorange, eastern redcedar. northern white-cedar, Austrian pine.	Eastern white pine, Norway spruce, red pine.	---
Ly: Lyles	---	Amur honeysuckle, silky dogwood, American cranberrybush, Amur privet.	Northern white-cedar, white fir, Washington hawthorn, blue spruce, Austrian pine.	Norway spruce, eastern white pine.	Pin oak.
MbB2: Markland	---	Tatarian honeysuckle, arrowwood, Amur honeysuckle, American cranberrybush, autumn-olive.	Washington hawthorn, eastern redcedar, osageorange, green ash, Austrian pine.	Norway spruce, white spruce, eastern white pine, pin oak.	---
McA: McGary	Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern redcedar, American cranberrybush, autumn-olive.	Austrian pine, Virginia pine.	---	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
No: Nolin	Silky dogwood	American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
Pb: Patton	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine.	Norway spruce, eastern white pine.	Pin oak.
Pg: Peoga Variant	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Austrian pine, blue spruce, white fir, Washington hawthorn.	Norway spruce, eastern white pine.	Pin oak.
Po: Petrolia	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, blue spruce, white fir, northern white-cedar, Washington hawthorn.	Norway spruce, eastern white pine.	Pin oak.
PsA: Proctor	---	Autumn-olive, silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
Ra: Ragsdale	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
ReA: Reesville	Silky dogwood	Amur privet, Amur honeysuckle, American cranberrybush, autumn-olive.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce	Eastern white pine, pin oak.
Sa, Sc: Selma	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine.	Norway spruce, eastern white pine.	Pin oak.
SdA: Stockland	---	Amur honeysuckle, silky dogwood, autumn-olive, American cranberrybush, Washington hawthorn, Amur privet.	Eastern redcedar, osageorange, northern white-cedar, Austrian pine.	Eastern white pine, Norway spruce, red pine.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
SyB2, SyC3, SyD3, SyF: Sylvan	---	Silky dogwood, autumn-olive, American cranberrybush, Amur honeysuckle, Amur privet.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
UdB*. Udorthents					
Vn, Vo: Vincennes	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, blue spruce, white fir, Washington hawthorn, Austrian pine.	Norway spruce, eastern white pine.	Pin oak.
Wa: Wakeland	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Wb: Wallkill	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, white fir, blue spruce, Washington hawthorn, Austrian pine.	Norway spruce, eastern white pine.	Pin oak.
Wc: Wallkill	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, white fir, blue spruce, Washington hawthorn, Austrian pine.	Norway spruce, eastern white pine.	Pin oak.
Zp, Zt: Zipp	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, blue spruce, white fir, Washington hawthorn, Austrian pine.	Norway spruce, eastern white pine.	Pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AdB-------------------- Ade	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.
AlA-------------------- Alford	Slight----------	Slight----------	Slight----------	Severe: erodes easily.	Slight.
AlB2------------------- Alford	Slight----------	Slight----------	Moderate: slope.	Severe: erodes easily.	Slight.
AlC2------------------- Alford	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
AlD3------------------- Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
AnB-------------------- Alvin	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
AnC-------------------- Alvin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
AnD-------------------- Alvin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ar--------------------- Armiesburg	Severe: floods.	Slight----------	Slight----------	Slight----------	Slight.
Ay--------------------- Ayrshire	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Bd--------------------- Birds	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
BlB-------------------- Bloomfield	Slight----------	Slight----------	Severe: slope.	Slight----------	Moderate: droughty.
BlD-------------------- Bloomfield	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: droughty, slope.
ChC-------------------- Chelsea	Slight----------	Slight----------	Severe: slope.	Slight----------	Moderate: droughty.
ClF-------------------- Chetwynd	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CoA-------------------- Conotton	Slight----------	Slight----------	Moderate: small stones.	Slight----------	Moderate: droughty.
Du*. Dumps					
Ed--------------------- Edwards Variant	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
EkA-------------------- Elkinsville	Slight----------	Slight----------	Slight----------	Severe: erodes easily.	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ElA Elston	Slight	Slight	Slight	Slight	Slight.
FaB Fairpoint	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: erodes easily.	Severe: small stones, droughty.
FbG Fairpoint	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, erodes easily.	Severe: small stones, droughty, slope.
Ha Haymond	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
Hb Haymond	Severe: floods.	Slight	Slight	Slight	Slight.
Hc Haymond Variant	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
HeA Henshaw	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
HkF Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
HoA, HoB2 Hosmer	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
HoC3 Hosmer	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
HoD3 Hosmer	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
IoA Iona	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: erodes easily.	Slight.
IvA Iva	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Kn Kings	Severe: ponding, percs slowly, too clayey.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
La Landes	Severe: floods.	Slight	Slight	Slight	Moderate: droughty.
Lo Lomax	Severe: floods.	Slight	Moderate: small stones.	Slight	Slight.
Ly Lyles	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MbB2 Markland	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
McA: McGary	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
No: Nolin	Severe: floods.	Slight	Slight	Severe: erodes easily.	Slight.
Pb: Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pg: Peoga Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
Po: Petrolia	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
PsA: Proctor	Slight	Slight	Slight	Slight	Slight.
Ra: Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
ReA: Reesville	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Sa, Sc: Selma	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
SdA	Slight	Slight	Slight	Slight	Slight.
SyB2: Sylvan	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
SyC3: Sylvan	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
SyD3: Sylvan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
SyF: Sylvan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
UdB*. Udorthents					
Vn: Vincennes	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
Vo: Vincennes	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, erodes easily.	Severe:
Wa: Wakeland	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: floods, wetness.	Severe: floods.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Wb----------------------- Wallkill	Severe: floods, wetness, excess humus.	Severe: wetness, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: wetness, floods.
Wc----------------------- Wallkill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Zp----------------------- Zipp	Severe: ponding, percs slowly, too clayey.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
Zt----------------------- Zipp	Severe: floods, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, floods.	Severe: ponding, too clayey.	Severe: ponding, floods, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
AdB---------------- Ade	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
AlA, AlB2---------- Alford	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AlC2--------------- Alford	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AlD3--------------- Alford	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
AnB---------------- Alvin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AnC---------------- Alvin	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AnD---------------- Alvin	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ar----------------- Armiesburg	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ay----------------- Ayrshire	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Bd----------------- Birds	Good	Fair	Good	Good	Fair	Good	Good	Good	Good	Good.
BlB, BlD----------- Bloomfield	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
ChC---------------- Chelsea	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
ClF---------------- Chetwynd	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CoA---------------- Conotton	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Du*. Dumps										
Ed----------------- Edwards Variant	Fair	Fair	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
EkA---------------- Elkinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ElA---------------- Elston	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FaB---------------- Fairpoint	Very poor.	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.
FbG---------------- Fairpoint	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Ha----------------- Haymond	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Hb Haymond	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
Hc Haymond Variant	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
HeA Henshaw	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
HkF Hickory	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
HoA, HoB2 Hosmer	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
HoC3 Hosmer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HoD3 Hosmer	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
IoA Iona	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
IvA Iva	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Kn Kings	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
La Landes	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Lo Lomax	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ly Lyles	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
MbB2 Markland	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
McA McGary	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
No Nolin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pb Patton	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Pg Peoga Variant	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Po Petrolia	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
PsA Proctor	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ra Ragsdale	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Poor.
ReA Reesville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Sa, Sc-------------- Selma	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
SdA----------------- Stockland	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SyB2, SyC3---------- Sylvan	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SyD3---------------- Sylvan	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
SyF----------------- Sylvan	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
UdB*. Udorthents										
Vn, Vo-------------- Vincennes	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Wa------------------ Wakeland	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Wb------------------ Wallkill	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wc------------------ Wallkill	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Zp------------------ Zipp	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Zt------------------ Zipp	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AdB: Ade	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
AlA: Alford	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
AlB2: Alford	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
AlC2: Alford	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
AlD3: Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
AnB: Alvin	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
AnC: Alvin	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
AnD: Alvin	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ar: Armiesburg	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, frost action.	Slight.
Ay: Ayrshire	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Bd: Birds	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.	Severe: wetness, floods.
BlB: Bloomfield	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
BlD: Bloomfield	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
ChC: Chelsea	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
ClF: Chetwynd	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CoA: Conotton	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
Du*. Dumps						

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ed------------ Edwards Variant	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
EkA------------ Elkinsville	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
ElA------------ Elston	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
FaB------------ Fairpoint	Moderate: large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, slope, large stones.	Moderate: frost action, shrink-swell.	Severe: small stones, droughty.
FbG------------ Fairpoint	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: small stones, droughty, slope.
Ha------------ Haymond	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
Hb------------ Haymond	Slight---------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action.	Slight.
Hc------------ Haymond Variant	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
HeA------------ Henshaw	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness.
HkF------------ Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
HoA------------ Hosmer	Moderate: wetness.	Slight---------	Moderate: wetness.	Slight---------	Severe: low strength, frost action.	Slight.
HoB2------------ Hosmer	Moderate: wetness.	Slight---------	Moderate: wetness.	Moderate: slope.	Severe: low strength, frost action.	Slight.
HoC3------------ Hosmer	Moderate: wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
HoD3------------ Hosmer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
IoA------------ Iona	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
IvA------------ Iva	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Kn------------ Kings	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding, too clayey.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
La: Landes	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, frost action.	Moderate: droughty.
Lo: Lomax	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: frost action, floods.	Slight.
Ly: Lyles	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
MbB2: Markland	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
McA: McGary	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
No: Nolin	Moderate: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Slight.
Pb: Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, low strength, frost action.	Severe: ponding.
Pg: Peoga Variant	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action.	Severe: wetness.
Po: Petrolia	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.	Severe: wetness, floods.
PsA: Proctor	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
Ra: Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
ReA: Reesville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Sa, Sc: Selma	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
SdA: Stockland	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
SyB2: Sylvan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
SyC3: Sylvan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
SyD3, SyF: Sylvan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
UdB*. Udorthents						
Vn----------------- Vincennes	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
Vo----------------- Vincennes	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Wa----------------- Wakeland	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.	Severe: floods.
Wb----------------- Wallkill	Severe: wetness, excess humus.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: wetness, floods, frost action.	Severe: wetness, floods.
Wc----------------- Wallkill	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength, frost action.	Severe: ponding.
Zp----------------- Zipp	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding, too clayey.
Zt----------------- Zipp	Severe: ponding.	Severe: floods, ponding, shrink-swell.	Severe: floods, ponding, shrink-swell.	Severe: floods, ponding, shrink-swell.	Severe: low strength, ponding, floods.	Severe: ponding, floods, too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AdB: Ade	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
AlA: Alford	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
AlB2: Alford	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
AlC2: Alford	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
AlD3: Alford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
AnB: Alvin	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
AnC: Alvin	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope, thin layer.
AnD: Alvin	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Ar: Armiesburg	Moderate: floods, percs slowly.	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods.	Poor: hard to pack.
Ay: Ayrshire	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Bd: Birds	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
BlB, BlD: Bloomfield	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage.
ChC: Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
ClF: Chetwynd	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
CoA: Conotton	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
Du*. Dumps					

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ed: Edwards Variant	Severe: ponding, percs slowly, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
EkA: Elkinsville	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
ElA: Elston	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
FaB: Fairpoint	Severe: percs slowly.	Moderate: slope, large stones.	Moderate: too clayey, large stones.	Slight	Poor: small stones.
FbG: Fairpoint	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Ha: Haymond	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Hb: Haymond	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
Hc: Haymond Variant	Severe: floods.	Severe: seepage, floods.	Severe: floods.	Severe: floods, seepage.	Good.
HeA: Henshaw	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
HkF: Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
HoA, HoB2: Hosmer	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
HoC3: Hosmer	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope.	Moderate: slope, wetness.	Fair: slope, wetness.
HoD3: Hosmer	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Poor: slope.
IoA: Iona	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
IvA: Iva	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Kn: Kings	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
La: Landes	Severe: poor filter.	Severe: seepage, floods.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Lo: Lomax	Moderate: floods.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Ly: Lyles	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: ponding.
MbB2: Markland	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
McA: McGary	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
No: Nolin	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Pb: Patton	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Pg: Peoga Variant	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Po: Petrolia	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
PsA: Proctor	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
Ra: Ragsdale	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
ReA: Reesville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Sa, Sc: Selma	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
SdA: Stockland	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
SyB2: Sylvan	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
SyC3: Sylvan	Moderate: slope.	Severe: slope.	Slight	Slight	Good.
SyD3, SyF: Sylvan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
UdB*. Udorthents					

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Vn: Vincennes	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Vo: Vincennes	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Wa: Wakeland	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Wb: Wallkill	Severe: floods, wetness, poor filter.	Severe: floods, seepage, excess humus.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: wetness, excess humus.
Wc: Wallkill	Severe: ponding, percs slowly.	Severe: ponding, seepage, excess humus.	Severe: ponding, seepage, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
Zp: Zipp	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Zt: Zipp	Severe: floods, ponding, percs slowly.	Severe: floods, ponding.	Severe: floods, ponding, too clayey.	Severe: floods, ponding.	Poor: too clayey, hard to pack, ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AdB------------------- Ade	Good	Probable	Improbable: too sandy.	Fair: too sandy.
AlA, AlB2------------- Alford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
AlC2------------------ Alford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
AlD3------------------ Alford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
AnB------------------- Alvin	Good	Probable	Improbable: too sandy.	Good.
AnC------------------- Alvin	Good	Probable	Improbable: too sandy.	Fair: slope.
AnD------------------- Alvin	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
Ar-------------------- Armiesburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Ay-------------------- Ayrshire	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bd-------------------- Birds	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
BlB------------------- Bloomfield	Good	Probable	Improbable: too sandy.	Fair: too sandy.
BlD------------------- Bloomfield	Good	Probable	Improbable: too sandy.	Fair: too sandy, slope.
ChC------------------- Chelsea	Good	Probable	Improbable: too sandy.	Fair: too sandy.
ClF------------------- Chetwynd	Poor: slope.	Probable	Probable	Poor: slope.
CoA------------------- Conotton	Good	Probable	Probable	Poor: small stones, area reclaim.
Du*. Dumps				
Ed-------------------- Edwards Variant	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
EkA------------------- Elkinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
ElA------------------- Elston	Good	Probable	Improbable: too sandy.	Fair: small stones, area reclaim.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
FaB: Fairpoint	Fair: large stones, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
FbG: Fairpoint	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Ha, Hb: Haymond	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Hc: Haymond Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
HeA: Henshaw	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HkF: Hickory	Poor: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HoA, HoB2: Hosmer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HoC3: Hosmer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
HoD3: Hosmer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
IoA: Iona	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
IvA: Iva	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Kn: Kings	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
La: Landes	Good	Probable	Improbable: too sandy.	Poor: thin layer.
Lo: Lomax	Good	Probable	Improbable: too sandy.	Fair: small stones, area reclaim.
Ly: Lyles	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
MbB2: Markland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
McA: McGary	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
No: Nolin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Pb: Patton	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Pg-------------------- Peoga Variant	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Po-------------------- Petrolia	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
PsA------------------- Proctor	Good------------------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ra-------------------- Ragsdale	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
ReA------------------- Reesville	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Sa, Sc---------------- Selma	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
SdA------------------- Stockland	Good------------------	Probable--------------	Probable--------------	Poor: area reclaim, small stones.
SyB2, SyC3------------ Sylvan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
SyD3------------------ Sylvan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
SyF------------------- Sylvan	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
UdB*. Udorthents				
Vn, Vo---------------- Vincennes	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wa-------------------- Wakeland	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wb-------------------- Wallkill	Poor: low strength, wetness, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess humus.
Wc-------------------- Wallkill	Poor: wetness, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess humus.
Zp, Zt---------------- Zipp	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AdB: Ade	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
AlA: Alford	Moderate: seepage.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
AlB2: Alford	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
AlC2, AlD3: Alford	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
AnB: Alvin	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Soil blowing	Favorable.
AnC, AnD: Alvin	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope, soil blowing.	Slope.
Ar: Armiesburg	Moderate: seepage.	Moderate: hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.
Ay: Ayrshire	Moderate: seepage.	Severe: wetness.	Severe: slow refill, cutbanks cave.	Frost action	Wetness, soil blowing.	Wetness, soil blowing.	Wetness.
Bd: Birds	Slight	Severe: wetness.	Severe: slow refill.	Floods, frost action.	Wetness, erodes easily, floods.	Erodes easily, wetness.	Wetness, erodes easily.
BlB: Bloomfield	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Soil blowing	Droughty, rooting depth.
BlD: Bloomfield	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, soil blowing.	Slope, droughty, rooting depth.
ChC: Chelsea	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
ClF: Chetwynd	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Slope	Slope.
CoA: Conotton	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, soil blowing.	Soil blowing	Droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Du*. Dumps							
Ed Edwards Variant	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, subsides.	Ponding, soil blowing, percs slowly.	Ponding, too sandy, soil blowing.	Wetness, percs slowly.
EkA Elkinsville	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
ElA Elston	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing	Soil blowing, too sandy.	Favorable.
FaB Fairpoint	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Large stones, droughty, rooting depth.	Large stones, erodes easily.	Large stones, erodes easily.
FbG Fairpoint	Severe: slope, slippage.	Severe: piping.	Severe: no water.	Deep to water	Large stones, droughty, rooting depth.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Ha Haymond	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, floods.	Erodes easily	Erodes easily.
Hb Haymond	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
Hc Haymond Variant	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Fast intake, soil blowing, floods.	Erodes easily, soil blowing.	Erodes easily.
HeA Henshaw	Slight	Severe: piping, wetness.	Severe: slow refill.	Favorable	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
HkF Hickory	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
HoA Hosmer	Moderate: seepage.	Severe: piping.	Severe: no water.	Percs slowly, frost action.	Percs slowly, wetness.	Erodes easily, wetness.	Erodes easily, wetness.
HoB2 Hosmer	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Slope, percs slowly, frost action.	Percs slowly, wetness, erodes easily, slope.	Erodes easily, wetness.	Erodes easily, wetness.
HoC3, HoD3 Hosmer	Severe: slope.	Severe: piping.	Severe: no water.	Slope, percs slowly, frost action.	Percs slowly, wetness, erodes easily, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, wetness.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
IoA: Iona	Moderate: seepage.	Moderate: thin layer, wetness.	Severe: no water.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
IvA: Iva	Moderate: seepage.	Severe: thin layer, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Kn: Kings	Slight	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, droughty, slow intake.	Ponding, percs slowly.	Wetness, droughty, percs slowly.
La: Landes	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.
Lo: Lomax	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.
Ly: Lyles	Moderate: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Ponding, frost action.	Ponding, soil blowing, rooting depth.	Ponding, soil blowing.	Wetness, rooting depth.
MbB2: Markland	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
McA: McGary	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
No: Nolin	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Pb: Patton	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding: frost action.	Ponding	Ponding	Wetness.
Pg: Peoga Variant	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Po: Petrolia	Slight	Severe: wetness.	Severe: slow refill.	Floods, frost action.	Wetness, floods.	Wetness	Wetness.
PsA: Proctor	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
Ra: Ragsdale	Slight	Severe: thin layer, ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
ReA: Reesville	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
Sa, Sc: Selma	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Floods, frost action.	Wetness, floods.	Wetness	Wetness.
SdA: Stockland	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Soil blowing, rooting depth.	Too sandy, soil blowing.	Rooting depth.
SyB2, SyC3: Sylvan	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
SyD3, SyF: Sylvan	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
UdB*. Udorthents							
Vn: Vincennes	Slight	Severe: wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Vo: Vincennes	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Wa: Wakeland	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Floods, frost action.	Wetness, erodes easily, floods.	Erodes easily, wetness.	Wetness, erodes easily.
Wb: Wallkill	Severe: seepage.	Severe: excess humus, wetness, piping.	Moderate: slow refill.	Floods, frost action.	Wetness, floods.	Wetness	Wetness.
Wc: Wallkill	Severe: seepage.	Severe: excess humus, ponding.	Slight	Ponding, frost action.	Ponding, erodes easily, percs slowly.	Ponding, erodes easily, percs slowly.	Wetness, erodes easily.
Zp: Zipp	Slight	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
Zt: Zipp	Slight	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly, floods.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
AdB---------------- Ade	0-17	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	17-32	Fine sand--------	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
	32-65	Stratified fine sand to loamy fine sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
	65-70	Fine sand--------	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
AlA, AlB2, AlC2-- Alford	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
	6-72	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	72-80	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
AlD3------------- Alford	0-4	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
	4-64	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	64-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
AnB, AnC, AnD---- Alvin	0-16	Fine sandy loam	SM, ML	A-4, A-2	0	100	100	80-95	30-60	<25	NP-4
	16-54	Fine sandy loam, sandy loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	90-100	20-80	15-38	NP-13
	54-60	Stratified sandy loam to fine sand.	SM, SP, SP-SM	A-2, A-3	0-5	95-100	90-100	70-95	4-35	<20	NP-4
Ar---------------- Armiesburg	0-16	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
	16-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
Ay---------------- Ayrshire	0-9	Fine sandy loam	CL, CL-ML, SC, SM-SC	A-4, A-6	0	100	100	70-85	40-60	20-30	5-15
	9-45	Sandy clay loam, loam, clay loam.	SC, CL	A-6	0	100	100	80-90	35-55	25-35	10-15
	45-55	Sandy loam-------	SC, SM-SC	A-4, A-6, A-2-4, A-2-6	0	100	100	60-70	30-40	15-25	5-15
	55-60	Stratified silt to loamy sand.	SM, ML, CL-ML, SM-SC	A-2-4, A-4	0	100	100	65-90	20-55	<20	NP-5
Bd---------------- Birds	0-7	Silt loam--------	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
	7-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
BlB, BlD---------- Bloomfield	0-30	Loamy fine sand, loamy sand.	SM, SP, SP-SM	A-2-4, A-3, A-4	0	100	100	70-90	4-40	---	NP
	30-80	Fine sand, sand, sandy loam, loamy sand.	SM, SP, SP-SM	A-2-4, A-4, A-3	0	100	100	65-80	4-40	<20	NP-3
ChC--------------- Chelsea	0-10	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	10-80	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
ClF--------------- Chetwynd	0-6	Loam-------------	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-95	60-95	22-33	4-12
	6-45	Clay loam, sandy clay loam, loam.	SC, CL	A-4, A-6	0	90-100	85-100	70-95	40-75	20-35	8-18
	45-76	Sandy loam, loam, sandy clay loam.	SM-SC, SC, CL-ML, CL	A-2-4, A-2-6, A-4, A-6	0	70-95	65-95	60-90	30-65	20-32	5-15
	76-80	Stratified sand to sandy loam.	SW-SM, SM, SP-SM	A-2, A-1, A-3, A-4	0	70-95	65-95	35-65	6-38	---	NP

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
CoA---------------- Conotton	0-15	Sandy loam--------	ML, SM	A-2, A-4	0	85-100	80-100	60-90	30-70	<30	NP-6
	15-52	Very gravelly sandy clay loam, gravelly sandy clay loam, gravelly sandy loam.	GM, SM, GM-GC, SW-SM	A-1, A-2	0-5	30-70	20-65	15-50	10-30	<25	NP-6
	52-60	Stratified very gravelly sand to very gravelly loamy sand.	GW, GM, SM, SW	A-1	0-10	25-65	15-60	10-40	0-20	---	NP
Du*. Dumps											
Ed---------------- Edwards Variant	0-20	Muck--------------	PT	A-8	0	100	90-100	80-90	10-20	---	---
	20-28	Marl--------------	CL	A-8	0	100	80-90	70-80	60-80	---	NP
	28-60	Gravelly sand-----	SP, SP-SM	A-3, A-1	0	95-100	70-95	40-70	5-25	---	NP
EkA--------------- Elkinsville	0-15	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-40	5-15
	15-42	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	85-100	65-90	30-40	8-18
	42-54	Silty clay loam, loam, sandy clay loam.	CL	A-4, A-6	0	100	100	80-100	50-90	30-40	8-18
	54-60	Stratified silty clay loam to sandy loam.	CL, CL-ML, ML, SM	A-4, A-6	0	100	100	70-100	45-80	<30	NP-15
ElA--------------- Elston	0-19	Sandy loam--------	SM	A-2, A-4	0	100	100	60-70	30-40	<30	NP-6
	19-32	Sandy loam, loam, sandy clay loam.	SM, CL, SC, ML	A-4, A-6	0	95-100	75-95	50-80	35-65	<30	NP-15
	32-43	Loamy sand, sandy loam.	SP-SM, SM, SC, SM-SC	A-2-4, A-3, A-1-B	0-3	95-100	75-95	45-75	5-30	<25	NP-10
	43-80	Sand, fine sand	SP-SM, SM	A-3, A-2-4, A-1-B	0-3	95-100	70-95	40-70	5-25	---	NP
FaB--------------- Fairpoint	0-18	Shaly silt loam	CL, CL-ML, SC, GC	A-4, A-6, A-2	5-15	55-90	45-85	40-85	30-75	20-40	4-18
	18-60	Gravelly clay loam, very shaly silty clay loam.	GC, CL, CL-ML, SC	A-4, A-6, A-7, A-2	15-30	55-75	25-65	20-65	15-60	25-50	4-24
FbG--------------- Fairpoint	0-2	Very shaly silt loam.	CL, CL-ML, SC, GC	A-4, A-6, A-2	5-15	55-90	45-85	40-85	30-75	20-40	4-18
	2-60	Gravelly clay loam, very shaly silty clay loam.	GC, CL, CL-ML, SC	A-4, A-6, A-7, A-2	15-30	55-75	25-65	20-65	15-60	25-50	4-24
Ha, Hb------------ Haymond	0-10	Silt loam---------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	10-44	Silt loam---------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	44-60	Fine sandy loam, silt loam, loam.	ML, SM	A-4	0	95-100	90-100	80-100	35-90	27-36	4-10
Hc---------------- Haymond Variant	0-15	Loamy sand--------	SM	A-2, A-3	0	100	100	50-75	15-30	---	NP
	15-44	Silt loam---------	ML, CL-ML, CL	A-4	0	100	100	90-100	80-90	24-36	4-12
	44-60	Stratified fine sandy loam to loamy sand.	SM, SM-SC	A-2, A-3	0	100	100	50-80	15-30	10-20	NP-7
HeA--------------- Henshaw	0-10	Silt loam---------	ML, CL, CL-ML	A-4	0	95-100	95-100	90-100	80-100	20-35	3-10
	10-49	Silty clay loam, silt loam.	CL, ML	A-6, A-4	0	95-100	95-100	95-100	85-100	30-40	8-18
	49-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HkF-------------- Hickory	0-12	Loam-------------	CL	A-6, A-4	0-5	95-100	90-100	90-100	85-95	20-35	8-15
	12-49	Clay loam--------	CL	A-6, A-7	0-5	100	90-100	80-95	75-90	30-50	15-30
	49-80	Clay loam, sandy loam, loam.	CL-ML, CL	A-4, A-6	0-5	85-100	85-95	80-95	60-80	20-40	5-20
HoA, HoB2-------- Hosmer	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	6-28	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	80-100	35-50	15-25
	28-64	Silt loam--------	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	10-25
	64-80	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
HoC3, HoD3------- Hosmer	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	6-19	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	80-100	35-50	15-25
	19-57	Silt loam--------	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	10-25
	57-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
IoA-------------- Iona	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	10-45	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	35-50	15-30
	45-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	20-35	5-15
IvA-------------- Iva	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	12-41	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	35-50	15-30
	41-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
Kn--------------- Kings	0-14	Silty clay-------	CL, CH	A-7	0	100	100	90-100	75-95	40-60	25-40
	14-43	Silty clay, clay	CL, CH	A-7	0	100	100	90-100	75-95	45-70	30-45
	43-60	Stratified clay to silt loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	25-35
La--------------- Landes	0-18	Loamy sand-------	SM, SC, SM-SC	A-4, A-2	0	100	95-100	85-95	20-50	<25	NP-10
	18-60	Stratified fine sand to loam.	SM, ML, SP-SM, SC	A-2, A-4	0	100	95-100	60-95	10-70	<30	NP-10
Lo--------------- Lomax	0-32	Loam-------------	CL, CL-ML	A-4, A-6	0	100	80-95	80-95	60-75	25-35	5-15
	32-44	Fine sandy loam, loam.	SM, SC, CL, ML	A-4, A-6, A-2	0	100	80-95	80-95	30-60	20-30	3-13
	44-60	Stratified fine sandy loam to fine sand.	SP-SM, SP, SM	A-3, A-2	0-5	100	70-90	70-90	3-20	<20	NP
Ly--------------- Lyles	0-17	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0	95-100	85-100	55-80	25-50	<20	NP-5
	17-37	Sandy loam, loam, fine sandy loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	95-100	85-100	50-80	35-60	20-30	4-14
	37-54	Stratified loamy fine sand to sandy clay loam.	SM, SM-SC, SC	A-4, A-6, A-1, A-2	0	95-100	85-100	45-85	15-40	15-35	NP-15
	54-60	Fine sand, sand, sandy loam.	SP-SM, SM, SM-SC	A-2-4, A-1-B, A-3	0	95-100	85-100	45-75	5-30	<20	NP-5
MbB2------------- Markland	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	9-39	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	39-60	Stratified clay to silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	75-95	35-60	20-35

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
McA McGary	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-15
	8-37	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	45-60	25-35
	37-60	Stratified silty clay loam to clay.	CL, CH	A-6, A-7	0	95-100	95-100	95-100	85-100	35-55	20-35
No Nolin	0-10	Silty clay loam	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	10-44	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
	44-60	Loam, silt loam	ML, CL, CL-ML	A-2, A-4, A-6	0-10	50-100	50-100	40-95	35-95	<30	NP-15
Pb Patton	0-17	Silt loam	CL	A-6	0	100	100	95-100	75-95	30-40	15-25
	17-37	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	80-100	40-55	15-25
	37-60	Stratified silt loam to silty clay loam.	CL	A-6	0	100	100	95-100	75-95	25-40	10-20
Pg Peoga Variant	0-10	Silt loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-30
	10-22	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-30
	22-54	Silty clay	CL, CH	A-7	0	100	100	90-100	85-100	45-60	25-35
	54-60	Clay loam	CL	A-6, A-7	0	100	100	90-100	85-95	35-50	20-32
Po Petrolia	0-7	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-45	12-20
	7-60	Silty clay loam, silt loam.	CL	A-6, A-7, A-4	0	100	95-100	80-100	60-100	20-45	8-20
PsA Proctor	0-15	Silt loam	CL	A-6	0	100	100	95-100	85-100	25-40	10-22
	15-52	Silt loam, loam.	CL	A-7, A-6	0	95-100	90-100	85-100	65-90	25-50	10-25
	52-60	Stratified loam to sand.	SC, CL, SM-SC, CL-ML	A-2, A-4, A-6	0	85-100	80-100	50-100	25-80	20-40	5-20
Ra Ragsdale	0-18	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	18-46	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	46-60	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
ReA Reesville	0-13	Silt loam	ML, CL-ML	A-4	0	100	90-100	90-100	85-100	24-36	4-10
	13-41	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7, A-4	0	100	90-100	90-100	90-100	22-50	4-28
	41-60	Silt loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	80-90	70-90	20-40	3-18
Sa Selma	0-15	Loam	CL	A-4, A-6	0	100	98-100	80-98	55-85	25-35	7-17
	15-52	Sandy clay loam, loam, clay loam.	CL, SC	A-6	0	100	95-100	80-95	38-85	24-36	11-19
	52-60	Stratified sand to loam.	SM-SC, SC, CL-ML, CL	A-2, A-4, A-6	0	90-100	85-100	60-90	30-70	15-35	5-20
Sc Selma	0-16	Clay loam	CL	A-6	0	100	100	85-100	60-90	25-40	11-20
	16-53	Sandy clay loam, clay loam.	CL, SC	A-6	0	100	95-100	80-95	38-85	24-36	11-19
	53-60	Stratified very coarse sand to loam.	SM-SC, SC, CL-ML, CL	A-2, A-4, A-6	0	90-100	85-100	60-90	30-70	15-35	5-20
SdA Stockland	0-17	Sandy loam	SC, SM, ML, CL	A-4, A-6, A-2	0-5	95-100	95-100	60-85	30-60	15-40	NP-15
	17-47	Very gravelly sandy loam, gravelly sandy loam, gravelly sandy clay loam.	SC, SM, SM-SC	A-4, A-6, A-2	0-5	75-95	50-75	40-65	25-50	15-40	NP-15
	47-80	Stratified gravelly sand to gravelly sandy loam.	SM, SP-SM, GP-GM, GM	A-1	0-15	35-60	25-50	20-40	5-25	<20	NP-5

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SyB2, SyC3, SyD3, SyF: Sylvan	0-7	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	7-38	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-50	20-30
	38-60	Silt loam	CL, CL-ML	A-6, A-4	0	100	100	95-100	95-100	20-40	5-20
UdB*. Udorthents											
Vn: Vincennes	0-10	Loam	CL	A-6	0	100	85-100	75-100	60-90	25-35	10-20
	10-54	Clay loam, sandy clay loam, loam.	CL, SC	A-6, A-7	0	100	85-100	60-100	35-80	35-45	15-25
	54-60	Stratified clay loam to sand.	SC, CL, SM, ML	A-6, A-4, A-2, A-1	0	100	85-100	40-90	15-55	15-35	NP-15
Vo: Vincennes	0-9	Clay loam	CL	A-6, A-7	0	95-100	85-100	75-100	65-75	30-40	10-18
	9-55	Clay loam, gravelly clay loam.	CL	A-6, A-7	0	95-100	75-85	60-85	55-75	35-50	15-25
	55-60	Gravelly clay loam, clay loam.	CL	A-6, A-7	0	95-100	70-85	65-85	50-70	25-35	7-15
Wa: Wakeland	0-7	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	7-60	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
Wb: Wallkill	0-3	Silt loam	ML, SM, OL	A-5, A-7	0	95-100	90-100	70-100	40-90	40-50	5-15
	3-17	Silt loam, loam, gravelly silt loam.	CL, CL-ML, SM-SC, SC	A-4	0	75-100	70-100	60-100	40-90	15-25	5-10
	17-60	Sapric material, hemic material.	PT	A-8	0	---	---	---	---	---	---
Wc: Wallkill	0-18	Silt loam	CL	A-4, A-6	0	100	95-100	90-100	80-95	24-34	8-15
	18-42	Sapric material	PT	A-8	0	---	---	---	---	---	---
	42-60	Silty clay	CL, CH	A-7	0	100	95-100	90-100	85-95	40-55	20-30
Zp: Zipp	0-5	Silty clay	CL, CH	A-7, A-6	0	100	100	95-100	90-95	35-55	20-30
	5-36	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	36-60	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-95	45-60	25-35
Zt: Zipp	0-6	Silty clay	CL, CH	A-7, A-6	0	100	100	95-100	90-95	35-55	15-30
	6-39	Silty clay	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	39-60	Silty clay	CL, CH	A-7	0	100	100	90-100	75-95	45-60	25-35

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
AdB-----------------	0-17	3-12	1.35-1.55	6.0-20	0.10-0.12	5.1-6.5	Low-----------	0.17	5	2	3-5
Ade	17-32	3-12	1.40-1.60	6.0-20	0.06-0.08	5.1-6.0	Low-----------	0.17			
	32-65	3-16	1.40-1.60	6.0-20	0.06-0.08	5.1-6.0	Low-----------	0.17			
	65-70	1-8	1.50-1.70	6.0-20	0.06-0.08	6.1-8.4	Low-----------	0.17			
AlA, AlB2, AlC2--	0-6	18-27	1.25-1.40	0.6-2.0	0.22-0.24	3.6-7.3	Low-----------	0.37	5	5	.5-2
Alford	6-72	22-30	1.35-1.50	0.6-2.0	0.18-0.20	3.6-6.0	Moderate------	0.37			
	72-80	8-20	1.30-1.45	0.6-2.0	0.20-0.22	4.5-7.3	Low-----------	0.37			
AlD3---------------	0-4	18-27	1.25-1.40	0.6-2.0	0.22-0.24	3.6-7.3	Low-----------	0.37	5	5	.5-2
Alford	4-64	22-30	1.35-1.50	0.6-2.0	0.18-0.20	3.6-6.0	Moderate------	0.37			
	64-70	8-20	1.30-1.45	0.6-2.0	0.20-0.22	4.5-7.3	Low-----------	0.37			
AnB, AnC, AnD----	0-16	10-15	1.45-1.65	2.0-6.0	0.14-0.20	5.1-6.5	Low-----------	0.24	5	3	.5-1
Alvin	16-54	15-18	1.45-1.65	0.6-2.0	0.12-0.20	4.5-6.0	Low-----------	0.24			
	54-60	3-10	1.55-1.75	6.0-20	0.05-0.13	5.1-7.8	Low-----------	0.24			
Ar-----------------	0-16	24-33	1.30-1.45	0.6-2.0	0.21-0.23	6.1-7.3	Moderate------	0.28	5	6	2-4
Armiesburg	16-60	24-33	1.30-1.45	0.6-2.0	0.18-0.20	6.1-7.3	Moderate------	0.28			
Ay-----------------	0-9	5-12	1.35-1.50	0.6-2.0	0.18-0.20	5.6-6.5	Low-----------	0.24	5	3	.5-2
Ayrshire	9-45	22-32	1.40-1.55	0.2-0.6	0.16-0.18	5.1-6.5	Low-----------	0.32			
	45-55	8-20	1.45-1.60	0.2-0.6	0.12-0.14	5.1-6.5	Low-----------	0.32			
	55-60	4-10	1.40-1.60	2.0-6.0	0.06-0.08	6.6-8.4	Low-----------	0.20			
Bd-----------------	0-7	15-25	1.20-1.40	0.2-0.6	0.22-0.24	5.6-7.8	Low-----------	0.43	5	6	1-3
Birds	7-60	18-27	1.40-1.60	0.2-0.6	0.20-0.22	5.1-7.8	Low-----------	0.43			
BlB, BlD----------	0-30	3-10	1.60-1.80	6.0-20	0.07-0.12	5.1-6.5	Low-----------	0.15	5	1	.5-2
Bloomfield	30-80	6-18	1.60-1.80	2.0-20	0.06-0.17	5.1-6.5	Low-----------	0.15			
ChC----------------	0-10	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low-----------	0.17	5	2	.5-1
Chelsea	10-80	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-5.5	Low-----------	0.17			
ClF----------------	0-6	12-24	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.32	5	5	1-3
Chetwynd	6-45	18-25	1.40-1.60	0.6-2.0	0.13-0.17	4.5-5.5	Moderate------	0.32			
	45-76	18-25	1.35-1.60	0.6-2.0	0.11-0.17	4.5-6.0	Low-----------	0.32			
	76-80	3-10	1.40-1.60	2.0-6.0	0.12-0.19	5.1-6.0	Low-----------	0.15			
CoA----------------	0-15	8-16	1.30-1.50	2.0-6.0	0.12-0.16	4.5-6.5	Low-----------	0.24	3	3	.5-3
Conotton	15-52	6-20	1.25-1.60	6.0-20	0.06-0.10	4.5-7.3	Low-----------	0.24			
	52-60	2-9	---	6.0-20	0.02-0.06	5.6-7.8	Low-----------	0.10			
Du*.											
Dumps											
Ed-----------------	0-20	---	0.30-0.55	2.0-6.0	0.35-0.45	5.6-7.3	Low-----------	----	---	3	55-75
Edwards Variant	20-28	---	---	0.06-0.2	0.18-0.25	7.4-8.4	Low-----------	----			
	28-60	1-5	1.55-1.70	6.0-20	0.06-0.08	6.6-8.4	Low-----------	----			
EkA----------------	0-15	15-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	.5-2
Elkinsville	15-42	22-30	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.0	Moderate------	0.37			
	42-54	16-30	1.45-1.65	0.6-2.0	0.15-0.20	4.5-5.5	Moderate------	0.37			
	54-60	20-34	1.40-1.60	0.6-2.0	0.17-0.21	4.5-6.0	Low-----------	0.37			
ElA----------------	0-19	8-18	1.35-1.55	2.0-6.0	0.12-0.15	5.6-6.0	Low-----------	0.20	4	3	1-5
Elston	19-32	10-23	1.35-1.60	2.0-6.0	0.12-0.18	4.5-6.0	Low-----------	0.20			
	32-43	4-10	1.45-1.65	2.0-6.0	0.08-0.13	5.6-6.0	Low-----------	0.20			
	43-80	1-5	1.60-1.75	>20	0.05-0.07	7.4-8.4	Low-----------	0.15			
FaB----------------	0-18	18-27	1.40-1.55	0.6-2.0	0.09-0.18	5.6-7.3	Low-----------	0.37	5	6	<.5
Fairpoint	18-60	18-35	1.60-1.80	0.2-0.6	0.03-0.10	5.6-7.3	Moderate------	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
FbG---------------- Fairpoint	0-2	18-27	1.40-1.55	0.6-2.0	0.09-0.18	5.6-7.3	Low-----------	0.37	5	6	<.5
	2-60	18-35	1.60-1.80	0.2-0.6	0.03-0.10	5.6-7.3	Moderate------	0.37			
Ha, Hb------------ Haymond	0-10	10-18	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
	10-44	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.37			
	44-60	10-18	1.30-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Low-----------	0.37			
Hc---------------- Haymond Variant	0-15	6-12	1.30-1.45	2.0-6.0	0.10-0.12	6.6-7.3	Low-----------	0.17	5	3	1-3
	15-44	12-18	1.30-1.50	0.6-2.0	0.20-0.22	6.1-7.3	Low-----------	0.37			
	44-60	6-12	1.30-1.50	0.6-2.0	0.08-0.13	6.1-7.3	Low-----------	0.28			
HeA--------------- Henshaw	0-10	12-27	1.30-1.40	0.6-2.0	0.18-0.23	5.6-6.5	Low-----------	0.43	4	5	.5-2
	10-49	18-34	1.30-1.50	0.2-0.6	0.15-0.19	5.1-7.3	Moderate------	0.43			
	49-60	15-34	1.35-1.55	0.2-0.6	0.17-0.22	6.6-8.4	Low-----------	0.43			
HkF--------------- Hickory	0-12	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low-----------	0.37	5	6	1-2
	12-49	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-5.5	Moderate------	0.37			
	49-80	15-22	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low-----------	0.37			
HoA, HoB2--------- Hosmer	0-6	10-17	1.20-1.40	0.6-2.0	0.20-0.24	4.5-6.0	Low-----------	0.43	4	5	1-2
	6-28	18-30	1.30-1.50	0.6-2.0	0.18-0.22	4.5-5.5	Moderate------	0.43			
	28-64	18-27	1.60-1.70	<0.06	0.06-0.08	4.5-5.0	Low-----------	0.43			
	64-80	10-18	1.30-1.50	0.2-0.6	0.06-0.08	4.5-6.0	Low-----------	0.43			
HoC3, HoD3-------- Hosmer	0-6	10-17	1.20-1.40	0.6-2.0	0.20-0.24	4.5-6.0	Low-----------	0.43	4	5	1-2
	6-19	18-30	1.30-1.50	0.6-2.0	0.18-0.22	4.5-5.5	Moderate------	0.43			
	19-57	18-27	1.60-1.70	<0.06	0.06-0.08	4.5-5.0	Low-----------	0.43			
	57-60	10-18	1.30-1.50	0.2-0.6	0.06-0.08	4.5-6.0	Low-----------	0.43			
IoA--------------- Iona	0-10	10-27	1.30-1.50	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	5	1-4
	10-45	18-35	1.40-1.60	0.2-0.6	0.18-0.22	5.1-7.3	Moderate------	0.37			
	45-60	10-27	1.30-1.40	0.6-2.0	0.20-0.22	7.4-8.4	Low-----------	0.37			
IvA--------------- Iva	0-12	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.43	4	5	1-3
	12-41	22-30	1.35-1.55	0.06-0.2	0.18-0.20	5.1-6.5	Moderate------	0.43			
	41-60	10-20	1.35-1.55	0.6-2.0	0.20-0.22	5.6-6.5	Low-----------	0.43			
Kn---------------- Kings	0-14	40-50	1.35-1.55	0.2-0.6	0.11-0.14	6.1-7.3	High----------	0.28	5	4	3-5
	14-43	42-55	1.40-1.70	<0.06	0.09-0.12	6.1-7.3	High----------	0.28			
	43-60	25-45	1.40-1.70	<0.06	0.08-0.12	6.1-7.8	High----------	0.28			
La---------------- Landes	0-18	5-20	1.40-1.60	2.0-6.0	0.10-0.18	6.1-8.4	Low-----------	0.20	5	3	1-2
	18-60	8-18	1.60-1.80	6.0-20	0.05-0.15	6.1-8.4	Low-----------	0.20			
Lo---------------- Lomax	0-32	12-18	1.35-1.55	2.0-6.0	0.18-0.22	5.1-6.5	Low-----------	0.28	5	5	2-4
	32-44	8-18	1.50-1.70	2.0-6.0	0.12-0.19	5.1-6.5	Low-----------	0.28			
	44-60	3-12	1.70-2.00	2.0-6.0	0.05-0.11	5.1-7.3	Low-----------	0.15			
Ly---------------- Lyles	0-17	7-20	1.40-1.60	0.6-2.0	0.14-0.18	6.1-7.8	Low-----------	0.20	5	3	3-6
	17-37	10-27	1.50-1.70	0.6-2.0	0.12-0.19	6.1-7.8	Low-----------	0.20			
	37-54	5-35	1.50-1.70	0.6-2.0	0.12-0.19	6.1-7.8	Low-----------	0.20			
	54-60	0-10	1.30-1.50	2.0-6.0	0.05-0.08	6.6-7.8	Low-----------	0.15			
MbB2-------------- Markland	0-9	20-27	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.43	3	5	1-3
	9-39	40-55	1.55-1.70	0.06-0.2	0.11-0.13	5.1-6.5	High----------	0.32			
	39-60	35-50	1.55-1.70	0.06-0.2	0.09-0.11	7.9-8.4	High----------	0.32			
McA--------------- McGary	0-8	22-27	1.35-1.50	0.6-2.0	0.22-0.24	6.6-7.3	Low-----------	0.43	3	5	1-4
	8-37	35-50	1.60-1.75	<0.2	0.11-0.13	5.6-7.8	High----------	0.32			
	37-60	35-50	1.60-1.75	<0.2	0.14-0.16	7.9-8.4	High----------	0.32			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
No---------------- Nolin	0-10	12-35	1.20-1.40	0.6-2.0	0.18-0.23	5.6-8.4	Low-----------	0.43	5	7	2-4
	10-44	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.6-8.4	Low-----------	0.43			
	44-60	10-30	---	0.6-6.0	0.10-0.23	5.1-8.4	Low-----------	0.43			
Pb---------------- Patton	0-17	27-35	1.15-1.35	0.6-2.0	0.21-0.23	6.6-7.3	Moderate-----	0.28	5	7	3-5
	17-37	27-35	1.25-1.45	0.2-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.28			
	37-60	22-35	1.30-1.50	0.2-2.0	0.18-0.22	7.4-8.4	Moderate-----	0.28			
Pg---------------- Peoga Variant	0-10	20-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Moderate-----	0.43	4	5	1-3
	10-22	30-38	1.35-1.50	0.06-0.2	0.18-0.20	4.5-6.0	Moderate-----	0.43			
	22-54	40-48	1.40-1.60	0.06-0.2	0.11-0.13	4.5-6.0	High----------	0.43			
	54-60	28-35	1.40-1.55	0.06-0.2	0.14-0.16	5.6-6.5	Moderate-----	0.43			
Po---------------- Petrolia	0-7	27-35	1.20-1.40	0.2-0.6	0.21-0.23	5.6-6.0	Moderate-----	0.32	4	7	2-3
	7-60	20-35	1.40-1.60	0.2-0.6	0.18-0.20	6.1-7.8	Moderate-----	0.32			
PsA--------------- Proctor	0-15	18-25	1.10-1.30	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.32	5	6	3-4
	15-52	25-35	1.20-1.45	0.6-2.0	0.15-0.20	5.6-6.5	Moderate-----	0.43			
	52-60	15-32	1.40-1.70	0.6-6.0	0.07-0.19	6.1-7.3	Low-----------	0.43			
Ra---------------- Ragsdale	0-18	18-27	1.50-1.70	0.6-2.0	0.22-0.24	6.1-7.3	Low-----------	0.28	5	5	4-6
	18-46	27-35	1.50-1.70	0.06-0.2	0.18-0.20	6.1-7.3	Moderate-----	0.28			
	46-60	20-27	1.50-1.70	0.06-0.2	0.20-0.22	6.6-8.4	Low-----------	0.28			
ReA--------------- Reesville	0-13	12-20	1.20-1.45	0.6-2.0	0.17-0.24	5.6-7.3	Low-----------	0.37	5	5	2-4
	13-41	22-35	1.30-1.55	0.2-2.0	0.17-0.22	5.1-8.4	Moderate-----	0.37			
	41-60	12-25	1.20-1.40	0.2-2.0	0.15-0.18	7.4-8.4	Low-----------	0.37			
Sa---------------- Selma	0-15	20-27	1.40-1.60	0.6-2.0	0.20-0.24	6.1-7.8	Low-----------	0.28	5	6	4-6
	15-52	18-30	1.40-1.60	0.6-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.28			
	52-60	7-18	1.60-1.90	2.0-6.0	0.07-0.19	6.6-8.4	Low-----------	0.28			
Sc---------------- Selma	0-15	25-30	1.35-1.55	0.6-2.0	0.17-0.23	6.1-7.8	Moderate-----	0.28	5	6	4-6
	15-52	18-30	1.40-1.60	0.6-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.28			
	52-60	7-18	1.60-1.90	2.0-6.0	0.07-0.19	6.6-8.4	Low-----------	0.28			
SdA--------------- Stockland	0-17	8-18	1.40-1.60	2.0-6.0	0.13-0.18	5.6-7.3	Low-----------	0.20	2	3	1-3
	17-47	10-22	1.65-1.85	2.0-6.0	0.12-0.15	5.6-7.3	Low-----------	0.15			
	47-80	2-8	1.80-2.00	6.0-20	0.02-0.10	6.6-8.4	Low-----------	0.15			
SyB2, SyC3, SyD3, SyF------------- Sylvan	0-7	18-27	1.20-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Low-----------	0.37	5	6	1-2
	7-38	25-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37			
	38-60	18-27	1.30-1.50	0.6-2.0	0.20-0.22	6.6-8.4	Moderate-----	0.37			
UdB*. Udorthents											
Vn---------------- Vincennes	0-10	10-25	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.43	5	5	1-3
	10-54	20-33	1.40-1.60	0.06-0.2	0.15-0.19	4.5-5.5	Moderate-----	0.43			
	54-60	15-25	1.50-1.70	0.2-0.6	0.12-0.16	5.6-7.3	Low-----------	0.43			
Vo---------------- Vincennes	0-9	27-32	1.30-1.45	0.6-2.0	0.17-0.19	5.1-7.3	Moderate-----	0.43	5	7	1-3
	9-55	27-35	1.40-1.60	0.06-0.2	0.14-0.17	5.1-6.0	Moderate-----	0.43			
	55-60	27-32	1.45-1.65	0.6-2.0	0.12-0.15	5.6-7.3	Moderate-----	0.43			
Wa---------------- Wakeland	0-7	10-17	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
	7-60	10-17	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.37			
Wb---------------- Wallkill	0-3	10-27	1.15-1.40	0.6-2.0	0.16-0.21	5.1-7.8	Low-----------	0.32	5	---	4-12
	3-17	15-27	1.15-1.45	0.6-2.0	0.15-0.20	5.1-7.8	Low-----------	0.32			
	17-60	---	0.25-0.45	2.0-20	0.35-0.45	5.6-7.8	--------------	----			
Wc---------------- Wallkill	0-18	12-25	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.8	Low-----------	0.37	5	6	1-3
	18-42	---	0.35-0.55	2.0-6.0	0.35-0.45	5.1-7.3	--------------	----			
	42-60	40-50	1.45-1.60	0.06-0.2	0.10-0.12	6.1-7.8	High----------	0.32			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
Zp---------------- Zipp	0-5	30-45	1.40-1.55	0.2-2.0	0.12-0.21	6.1-7.3	High----------	0.28	5	4	1-3
	5-36	40-55	1.55-1.70	<0.2	0.11-0.13	6.1-7.3	High----------	0.28			
	36-60	35-50	1.55-1.70	<0.2	0.08-0.10	7.9-8.4	High----------	0.28			
Zt---------------- Zipp	0-6	36-42	1.40-1.60	0.2-2.0	0.12-0.14	6.1-7.3	High----------	0.28	5	4	1-3
	6-39	40-55	1.45-1.70	<0.2	0.11-0.13	6.1-7.3	High----------	0.28			
	39-60	36-55	1.50-1.70	<0.2	0.08-0.10	6.1-7.8	High----------	0.28			

*See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

[See text for definition of terms. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AdB: Ade	A	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
AlA, AlB2, AlC2, AlD3: Alford	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	High.
AnB, AnC, AnD: Alvin	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
Ar: Armiesburg	B	Rare	---	---	>6.0	---	---	>60	---	High	Moderate	Low.
Ay: Ayrshire	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.
Bd: Birds	C/D	Rare	---	---	0-3.0	Apparent	Mar-Jun	>60	---	High	High	Moderate.
BlB, BlD: Bloomfield	A	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
ChC: Chelsea	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Low.
ClF: Chetwynd	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
CoA: Conotton	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
Du*. Dumps												
Ed: Edwards Variant	B/D	None	---	---	+.5-1.0	Apparent	Sep-Jun	>60	---	High	High	Low.
EkA: Elkinsville	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	High.
ElA: Elston	B	None	---	---	>6.0	---	---	>60	---	Low	Low	Moderate.
FaB, FbG: Fairpoint	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Ha: Haymond	B	Frequent	Brief	Jan-May	>6.0	---	---	>60	---	High	Low	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Hb: Haymond	B	Rare	---	---	>6.0	---	---	>60	---	High	Low	Low.
Hc: Haymond Variant	B	Frequent	Brief	Jan-May	>6.0	---	---	>60	---	High	Low	Low.
HeA: Henshaw	C	None	---	---	1.0-2.0	Apparent	Nov-Mar	>60	---	High	High	Moderate
HkF: Hickory	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate
HoA, HoB2, HoC3, HoD3: Hosmer	C	None	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	High	Moderate	High.
IoA: Iona	B	None	---	---	2.0-4.0	Perched	Mar-Apr	>60	---	High	High	Moderate
IvA: Iva	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate
Kn: Kings	C/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	Moderate	High	Low.
La: Landes	B	Rare	---	---	3.0-6.0	Apparent	Mar-May	>60	---	Moderate	Low	Low.
Lo: Lomax	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
Ly: Lyles	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
MbB2: Markland	C	None	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	Moderate	High	Moderate
McA: McGary	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	Moderate	High	Low.
No: Nolin	B	Rare	---	---	4.0-6.0	Apparent	Feb-Mar	>60	---	Moderate	Low	Moderate
Pb: Patton	B/D	None	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High	High	Low.
Pg: Peoga Variant	C	None	---	---	0-1.0	Apparent	Jan-May	>60	---	High	High	High.
Po: Petrolia	B/D	Frequent	Long	Mar-Jun	0-3.0	Apparent	Apr-Jun	>60	---	High	High	Low.
PsA: Proctor	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
a Ragsdale	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
eA Reesville	C	None	---	---	1.0-2.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.
a, Sc Selma	B/D	None	---	---	0-2.0	Apparent	Mar-Jun	>60	---	High	High	Low.
dA Stockland	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Moderate.
yB2, SyC3, SyD3, SyF Sylvan	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
dB*. Udorthents												
n Vincennes	C/D	Rare	---	---	0-1.0	Apparent	Jan-May	>60	---	High	High	High.
o Vincennes	C/D	None	---	---	+.5-1.0	Apparent	Jan-May	>60	---	High	High	High.
a Wakeland	B/D	Frequent	Brief	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Low.
b Wallkill	D	Frequent	Brief to long.	Sep-Jun	0-0.5	Apparent	Sep-Jun	>60	---	High	Moderate	Moderate.
c Wallkill	C/D	None	---	---	+.5-1.0	Apparent	Dec-May	>6	---	High	High	Moderate.
p Zipp	C/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	Moderate	High	Low.
t Zipp	C/D	Frequent	Brief	Dec-May	+.5-1.0	Apparent	Dec-May	>60	---	Moderate	High	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution										Liquid limit	Plasticity index	Moisture density	
			Percentage passing sieve--							Percentage smaller than--						
	AASHTO	Unified	2 inch	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Max. dry density	Optimum moisture
													Pct		Lb/Ft3	Pct
Armiesburg sicl:[1] (S76IN-083-019)																
Ap--------0 to 8	A-6 (13)	CL	100	100	100	100	100	98	88	54	32	20	37	14	106	18
B22-------24 to 38	A-7-6(22)	CL	100	100	100	100	100	97	91	56	34	26	44	23	104	19
C---------38 to 60	A-6 (19)	CL	100	100	100	100	100	99	96	44	26	20	37	20	105	18
Haymond sil:[2] (S77IN-083-007)																
Ap--------0 to 10	A-4 (06)	CL-ML	100	100	100	100	100	100	95	51	29	24	28	7	111	15
B21-------10 to 25	A-4 (04)	CL-ML	100	100	100	100	100	100	88	31	13	10	27	6	112	14
B22-------25 to 60	A-4 (01)	CL-ML	100	100	100	100	100	100	69	21	7	3	22	5	113	14
Hosmer sil:[3] (S76IN-083-004)																
Ap--------0 to 6	A-4 (02)	ML	100	100	100	100	100	99	97	56	17	11	27	2	104	18
B21t------13 to 21	A-6 (13)	ML	100	100	100	100	100	100	99	65	29	23	39	11	106	18
B22t------21 to 28	A-6 (13)	ML	100	100	100	100	100	100	99	65	29	23	39	11	106	18
Bx1-------30 to 45	A-6 (13)	CL	100	100	100	100	100	99	99	56	19	14	36	12	107	18
Bx2-------45 to 65	A-6 (13)	CL	100	100	100	100	100	99	99	56	19	14	36	12	107	18
Kings sic:[4] (S76IN-083-013)																
Ap--------0 to 6	A-7-6(47)	CH	100	100	100	100	100	100	98	75	56	43	69	41	91	22
B21g------14 to 20	A-7-6(42)	CH	100	100	100	100	100	100	99	81	57	45	59	37	99	23
B22g------20 to 60	A-7-6(31)	CH	100	100	100	100	100	100	98	79	52	40	51	28	107	19
Selma cl:[5] (S76IN-083-020)																
Ap--------0 to 7	A-6 (05)	CL	100	100	99	97	93	81	51	34	25	19	35	16	108	18
B21t------16 to 33	A-6 (05)	CL	100	100	100	98	93	81	52	35	26	19	30	17	110	17
C---------57 to 65	A-1-B(01)	SP-SM	100	100	94	88	79	25	6	--	--	--	--	NP	--	--
Stockland sl:[6] (S76IN-083-002)																
Ap--------0 to 13	A-4 (00)	SM	100	100	100	100	99	86	43	23	13	11	20	1	118	13
B21t------13 to 28	A-2-4(00)	SC	100	86	73	63	51	32	13	9	6	5	26	8	123	11
IIc-------37 to 60	A-1-B(01)	SW	100	97	92	86	70	26	4	1	--	--	--	NP	--	--

[1] Armiesburg silt loam: 2,800 feet south and 50 feet west of the northeast corner of sec. 28, T. 5 N., R. 7 W.

[2] Haymond sandy loam: 1,800 feet east and 300 feet north of the southwest corner of sec. 2, T. 1 S., R. 11 W.

[3] Hosmer sandy loam: 1,340 feet east and 435 feet south of the northwest corner of donation 68, T. 3 N., R. 9 W.

[4] Kings silty clay loam: 90 feet east and 1,225 feet south of the northwest corner of sec. 18, T. 5 N., R. 7 W.

[5] Selma clay loam: 1,400 feet east and 1,000 feet north of the west corner of donation 205, T. 4 N., R. 10 W.

[6] Stockland sandy clay loam: 750 feet east and 50 feet north of the southwest corner of donation 175, T. 5 N., R. 10 W.

TABLE 20.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
*Ade	Coarse-loamy, mixed, mesic Psammentic Argiudolls
Alford	Fine-silty, mixed, mesic Typic Hapludalfs
Alvin	Coarse-loamy, mixed, mesic Typic Hapludalfs
Armiesburg	Fine-silty, mixed, mesic Fluventic Hapludolls
Ayrshire	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Birds	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
*Bloomfield	Coarse-loamy, mixed, mesic Psammentic Hapludalfs
Chelsea	Mixed, mesic Alfic Udipsamments
Chetwynd	Fine-loamy, mixed, mesic Typic Hapludults
*Conotton	Loamy-skeletal, mixed, mesic Typic Hapludalfs
Edwards Variant	Marly, euic, mesic Limnic Medisaprist
*Elkinsville	Fine-silty, mixed, mesic Ultic Hapludalfs
*Elston	Coarse-loamy, mixed, mesic Typic Argiudolls
Fairpoint	Loamy-skeletal, mixed, nonacid, mesic Typic Udorthents
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Haymond Variant	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Henshaw	Fine-silty, mixed, mesic Aquic Hapludalfs
Hickory	Fine-loamy, mixed, mesic Typic Hapludalfs
Hosmer	Fine-silty, mixed, mesic Typic Fragiudalfs
Iona	Fine-silty, mixed, mesic Typic Hapludalfs
Iva	Fine-silty, mixed, mesic Aeric Ochraqualfs
Kings	Fine, montmorillonitic, mesic Vertic Haplaquolls
Landes	Coarse-loamy, mixed, mesic Fluventic Hapludolls
*Lomax	Coarse-loamy, mixed, mesic Cumulic Hapludolls
Lyles	Coarse-loamy, mixed, mesic Typic Haplaquolls
Markland	Fine, mixed, mesic Typic Hapludalfs
McGary	Fine, mixed, mesic Aeric Ochraqualfs
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Patton	Fine-silty, mixed, mesic Typic Haplaquolls
Peoga Variant	Fine, mixed, mesic Typic Ochraqualfs
Petrolia	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
*Proctor	Fine-silty, mixed, mesic Typic Argiudolls
Ragsdale	Fine-silty, mixed, mesic Typic Argiaquolls
Reesville	Fine-silty, mixed, mesic Aeric Ochraqualfs
Selma	Fine-loamy, mixed, mesic Typic Haplaquolls
Stockland	Loamy-skeletal, mixed, mesic Typic Hapludolls
Sylvan	Fine-silty, mixed, mesic Typic Hapludalfs
Udorthents	Sandy-skeletal, mixed, mesic Typic Udorthents
Vincennes	Fine-loamy, mixed, nonacid, mesic Typic Haplaquepts
Wakeland	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Wallkill	Fine-loamy, mixed, nonacid, mesic Thapto-Histic Fluvaquents
Zipp	Fine, mixed, nonacid, mesic Typic Haplaquepts

*This soil is a taxadjunct to the series. See text for description of those characteristics of the soil that are outside the range of the series.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1981 -347-827/1063

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.